Three alternatives were evaluated for additional corrective measures at AOI 43; namely, two active remediation technologies, and one engineering control. In addition, the Facility-wide institutional controls are integral components of all potential corrective measures alternatives. The technologies are soil excavation and sub-slab depressurization for indoor air mitigation. The engineering control is for the Facility building; namely, operation of the Facility HVAC system, or equivalent, when the building is occupied.

Excavation Alternative

For the excavation alternative, the area of 1,400 square feet would be excavated to a depth of seven feet. Major components include demolition of the concrete floor (indoor) and concrete driveway (outdoor), column support, excavation sheeting and shoring, backfilling and replacement of the concrete floor and driveway. Soil would be excavated and transported off site for treatment/disposal. The implementation schedule is estimated at three months for design, pre-construction planning and implementation. There are no subsequent operation and maintenance components.

With regard to threshold criteria, this technology is protective and attains media cleanup objectives because soil constituents that contribute to potentially unacceptable risks are removed. The historical source of the release at this area has been eliminated; there are no further releases. On a Facility-wide basis, excavation and removal of a relatively small volume of contaminated soil has limited effect.

With respect to balancing criteria, this technology has high long-term reliability and effectiveness because unacceptable concentrations of soil constituents are permanently and verifiably removed. This technology results in a high reduction of the waste volume because soil constituents are removed. This technology has high short-term effectiveness because of the short amount of time to complete excavation. This technology has moderate implementability because of its complicating demolition, underpinning and construction elements. This technology has the highest cost. Community acceptance is not anticipated to be a differentiator for excavation at the Facility.

Sub-Slab Depressurization

For the sub-slab depressurization indoor air mitigation alternative, the affected area of 1,400 square feet would be addressed. Major components include saw-cutting the 16-feet long concrete floor trench, header pipe, one depressurization point, fan (two-inch water vacuum), venting to outdoor atmosphere, and concrete floor replacement. The implementation schedule is estimated at three to four months for design and installation. Subsequent operation and maintenance include periodic system checks and occasional maintenance of the fan.

With regard to threshold criteria, this technology is protective and attains media cleanup objectives because it reduces potential exposure to constituents in indoor air by removing constituents contributing to unacceptable risks from the building. The historical source of the release at this area has been eliminated; there are no further releases. On a Facility-wide basis, venting of a relatively small volume of contaminants from beneath the floor slab has limited effect.

With respect to balancing criteria, this technology has medium long-term reliability and effectiveness because soil constituents are removed; however, not as reliably as they are by excavation. In addition, mechanical systems depend on power, O&M and component life. This technology results in a low reduction of the waste volume because depressurization is a slow source-removal technology. This technology has medium short-term effectiveness because of the longer amount of time to take effect. This technology has easy implementability because of its simpler construction elements. This technology has medium cost. Community acceptance is not anticipated to be a differentiator for sub-slab depressurization at the Facility.

Engineering Control – Operate HVAC (Facility)

With regard to threshold criteria, this engineering control is protective in combination with ICs because it reduces potential exposures to unacceptable indoor air concentrations; air concentrations at levels posing a potentially unacceptable risk are prevented from developing inside the building. This engineering control attains media cleanup objectives in combination with ICs because it reduces exposure to unacceptable air concentrations. The historical source of the release at this area has been eliminated; there are no further releases.

With respect to balancing criteria, this engineering control has medium long-term reliability because it is required by building code; and mechanical systems depend on power, O&M, and component life. This engineering control results in low reduction of waste. This engineering control has high short-term effectiveness because of the short amount of time to implement and take effect. This engineering control has easy implementability when compared to technologies such as excavation. This engineering control has low cost. Community acceptance is not anticipated to be a differentiator for engineering controls at the Facility.

Recommended Final Corrective Measures AOI 43

Based on the preceding evaluation of corrective measures alternatives, the recommended final corrective measures for AOI 43 are the combination of operating the Facility HVAC system, or equivalent, with the Facility-wide industrial land use restriction and implementation of the Facility's excavation policy. Together, this combination of an engineering control and institutional controls is most appropriate because it is highly effective in the short term, more easily implemented than other alternatives, and the most cost effective compared with the other alternatives. In addition, the recommended corrective measures utilize existing infrastructure, and do not change existing conditions, or create additional inadvertent migration pathways by disturbing the existing concrete.

Even though residual VOC concentrations in shallow overburden groundwater do not impact this area, implementation of source removal alternatives in soil would not substantially change the need for or duration of institutional controls when looking at the site as a whole. In effect, the area of soil addressed by source removal would impact an area of 1,400 square feet of the approximately 82 acres of improved facility area.

5.3 AOI 45

Vinyl chloride concentrations in soil were identified as contributing significantly to the predicted risks for the soil vapor intrusion pathway in this area. The affected area is inside the northeast portion of Building 31, in an area known as the Hattebur Dock, beneath a concrete floor, in an area with structural columns bordering the exterior wall. The affected area is 10,800 square feet. The groundwater table is encountered at a depth of approximately five feet in this area.

Three alternatives were evaluated for additional corrective measures at AOI 45; namely, two active remediation technologies, and one engineering control. In addition, the Facility-wide institutional controls are integral components of all potential corrective measures alternatives. The technologies are soil excavation and sub-slab depressurization for indoor air mitigation. The engineering control is for the Facility building; namely, operation of the Facility HVAC system, or equivalent, when the building is occupied.

Excavation Alternative

For the excavation alternative, the area of 10,800 square feet would be excavated to a depth of five feet. Major components include demolition of the concrete floor, column support, excavation sheeting and shoring, backfilling, and replacement of the concrete floor and driveway. Soil would be excavated and transported off site for treatment/disposal. The implementation schedule is estimated at three months for design, pre-construction planning and implementation. There are no subsequent operation and maintenance components.

With regard to threshold criteria, this technology is protective and attains media cleanup objectives because soil constituents that contribute to potentially unacceptable risks are immediately removed. The historical source of the release at this area has been eliminated; there are no further releases. On a Facility-wide basis, excavation and removal of a relatively small volume of contaminated soil has limited effect.

With respect to balancing criteria, this technology has high long-term reliability and effectiveness because unacceptable concentrations of soil constituents are permanently and verifiably removed. This technology results in a high reduction of the waste volume because soil constituents are removed. This technology has high short-term effectiveness because of the short amount of time to complete excavation. This technology has moderate implementability because of its complicating demolition, underpinning and construction elements. This technology has the highest cost. Community acceptance is not anticipated to be a differentiator for excavation at the Facility.

Sub-Slab Depressurization Alternative

For sub-slab depressurization indoor air mitigation, major components include saw-cutting 14-feet long concrete floor trenches, three depressurization points, three fans (two-inch water vacuum), venting to outdoor atmosphere, and concrete floor replacement. The implementation schedule is estimated at six months for design and installation. Subsequent operation and maintenance include periodic system checks and occasional maintenance of the fans.

With regard to threshold criteria, this technology is protective and attains media cleanup objectives because it reduces potential exposure to constituents in indoor air by removing constituents contributing to unacceptable risks from the building. The historical source of the release at this area has been eliminated; there are no further releases. On a Facility-wide basis, venting of a relatively small volume of contaminants from beneath the floor slab has limited effect.

With respect to balancing criteria, this technology has medium long-term reliability and effectiveness because soil constituents are removed; however, not as reliably as they are by excavation. In addition, mechanical systems depend on power, O&M and component life. This technology results in a low reduction of the waste volume because depressurization is a slow source-removal technology. This technology has medium short-term effectiveness because of the longer amount of time to take effect. This technology has easy implementability because of its simpler construction elements. This technology has medium cost. Community acceptance is not anticipated to be a differentiator for sub-slab depressurization at the Facility.

Engineering Control – Operate HVAC (Facility)

With regard to threshold criteria, this engineering control is protective in combination with ICs because it reduces potential exposure to unacceptable indoor air concentrations; air concentrations at levels posing a potentially unacceptable risk are prevented from developing inside the building. This engineering control attains media cleanup objectives in combination with ICs because it reduces exposure to unacceptable air concentrations. The historical source of the release at this area has been eliminated; there are no further releases.

With respect to balancing criteria, this engineering control has medium long-term reliability because it is required by building code; and mechanical systems depend on power, O&M, and component life. This engineering control results in a low reduction of waste. This engineering control has high short-term effectiveness because of the short amount of time to implement and take effect. This engineering control has easy implementability when compared to technologies such as excavation. This engineering control has low cost. Community acceptance is not anticipated to be a differentiator for engineering controls at the Facility.

Recommended Final Corrective Measures AOI 45

Based on the preceding evaluation of corrective measures alternatives, the recommended final corrective measures for AOI 45 are the combination of operating the Facility HVAC system, or equivalent, with Facility-wide industrial land use restriction and the Facility's excavation policy. Together, this combination of an engineering control and institutional controls is most appropriate because it is highly effective in the short term, more easily implemented than other alternatives, and is significantly less expensive compared with the other alternatives. In addition as with AOI 43, the recommended corrective measure utilizes existing infrastructure, and does not change existing conditions, or create additional inadvertent migration pathways by disturbing the existing concrete.

Due to residual VOC concentrations in shallow overburden groundwater, implementation of source removal alternatives in soil would not substantially change the need for or duration of institutional and engineering controls for this area. Evaluation of corrective measures for overburden groundwater is presented in Section 5.4.1.

5.4 Overburden Groundwater and Bedrock Groundwater

Four alternatives were evaluated for groundwater, both in the overburden and in bedrock; namely, three active remediation technologies and one institutional control. In addition, the Facility-wide institutional controls are integral components of all potential corrective measures alternatives. The three technologies are migration control, bedrock groundwater pump-and-treat, and bedrock groundwater enhanced anaerobic bioremediation. The institutional control is restrictions of groundwater use and continued enforcement of the Facility Excavation Policy.

5.4.1 Overburden Groundwater

Because of the demonstrated effectiveness of the overburden groundwater migration control as an interim measure, and the likely inability of an available in-situ groundwater treatment technology to overcome groundwater complexities, no other alternatives were evaluated. Under this alternative, the existing overburden migration control system that has been operating as an interim measure would continue to operate as the final corrective measure.

As discussed in the RFI and Environmental Indicator reports, TCE and other VOCs are widely encountered above unrestricted potable use standards in overburden groundwater in central portions of the Facility. Shallow overburden/water table groundwater flow at the Facility is largely controlled by the storm sewers, sewer backfill and other appurtenances on site that penetrate the water table. This network of appurtenances has effectively limited the spread of dissolved phase VOCs in groundwater. As discussed in Section 1.5.6, the Overburden Migration Control (OBMC) interim measure was installed to intercept and capture shallow overburden groundwater migrating through these features. The RCRA CA750 Environmental Indicator Report and subsequent positive determination by the USEPA confirmed that the existing OBMC system effectively limits further plume expansion. Figure 15 presents the average daily VOC mass removal and cumulative VOC mass removal of the OBMC since start-up.

Groundwater investigations in the Second Sand hydrostratigraphic unit identified VOCs above unrestricted potable use criteria in the central portion of the Facility. Sampling conducted in support of the RCRA CA750 Environmental Indicator determination confirmed stability of the plume in this hydrostratigraphic unit. However, more recent sampling indicates an increasing trend in TCE concentrations in two Second Sand wells: MW-516 and MW-759 (Figures 11 and 12, respectively). These wells are located on the north central side of the active manufacturing area, in the vicinity of the OBMC system. Figure 13 shows the locations of these wells and the potentiometric surface of the Second Sand.

A field investigation program has recently been completed which further defined the character of the Second Sand. As part of this effort, the top and bottom of the unit was mapped, and testing was conducted for the potential presence of DNAPL. A recovery well was installed in

an area of potential DNAPL accumulation (e.g., a low spot in the Second Sand unit). This well was installed with a blind sump that extends into the underlying clay (in a manner similar to DNAPL recovery wells installed in the First Sand around AOI-21) to maximize the potential for DNAPL accumulation. A pumping test will be performed on this new recovery well to support the design of interim measure augmentation. The pumping test will help establish potential groundwater recovery rates, area of influence, and water quality needed to design a treatment system. The schedule for implementation is to conduct the pumping test and complete IM construction by August 2006.

In addition to contributions of VOCs to groundwater from overlying soils, residual DNAPL and LNAPL have also been observed on site and represent a potential source of dissolved phase constituents to groundwater. These areas are within the footprint of the existing groundwater plume. As such, they can be addressed as part of the site-wide shallow groundwater corrective measures.

The corrective measures alternative for overburden groundwater impacted by VOCs include continued operation of the existing shallow overburden groundwater migration control system, and continued monitoring of plume conditions in overburden monitoring wells to ensure plume stability. The migration control system will continue to be operated in the same effective manner that it has been for the past several years. Groundwater monitoring will continue in accordance with an updated Monitoring Plan presented in Section 6, with periodic agency-endorsed review and modification, as necessary. (This plan continues to meet the requirements of the RCRA CA750 verification sampling.) This monitoring will also ensure that constituents remaining in soil do not adversely impact groundwater such that modification to the existing groundwater migration control system would be warranted.

Given the area of overburden groundwater impact is limited to Delphi property, the primary institutional control will include a modification to the deed that will prohibit well installation on the property for the purposes of potable or non-potable use. It is assumed that the existing Administrative Order on Consent or an implementation order will be amended/established to reflect environmental covenants related to these groundwater use restrictions pursuant to the Ohio Environmental Covenants Act (Ohio Revised Code 5301.80 - 5301.92). In addition, the facility Excavation Policy will prevent unacceptable exposures to shallow groundwater and residual DNAPL.

As discussed above, additional investigation and pilot testing is currently underway in this area to support the design and construction of a interim measure augmentation. In keeping with the performance-based approach deployed at this site, Delphi assumes this interim measure will become part of the final corrective measures. To satisfy the requirements of the Administrative Order and make this CMP as comprehensive as possible, this Interim Measure is proposed to address Second Sand overburden groundwater impacted by VOCs near MW-516.

A Second Sand groundwater migration control system will be installed and will include the following elements:

- Total fluids (potentially vacuum-enhanced) pumping from a single recovery well. Due to the low transmissivity of this formation, recovery rates are expected to be relatively low (less than 5 gallons per minute).
- Separate phase DNAPL (if recovered) will be separated from the influent stream in a baffled separation tank.
- Initial pre-treatment of recovered groundwater with either an air-stripper or synthetic resin adsorption beds to reduce anticipated high VOC concentrations (TCE potentially greater than 200,000 μg/L).
- Conveyance of pre-treated water to the Bedrock Migration Control treatment system through an available 2-inch diameter discharge line that was installed in the carrier pipe during construction of the OBMC system.

With regard to threshold criteria, the combination of groundwater migration control technology and institutional controls is protective. This technology attains media cleanup objectives because migration of groundwater with constituents above applicable risk criteria is controlled. Historical releases to groundwater have been eliminated to the extent practicable; residual DNAPL remains but removal is technically not practicable. Therefore, plume management and exposure controls are necessary for source control.

With regard to balancing criteria, this technology has high long-term reliability and effectiveness as demonstrated by successful history of this active interim measure. This technology results in low reduction of waste. This technology has high short-term effectiveness because the system is largely in place and operating as an interim measure. This technology has easy implementation because site construction and permit components are currently in place as the interim measure. This technology has medium cost. This technology is anticipated to have high community acceptance because it is not intrusive in the neighborhood, and it effectively controls groundwater migration.

Recommended Final Corrective Measures Overburden Groundwater

On-site in-situ treatment of overburden groundwater is not practicable due to the complexity of the distribution of groundwater through a network of utilities and structures and the heterogeneous subsurface strata. Based on the preceding evaluation which demonstrated that the existing system favorably meets remedy alternative evaluation criteria, the recommended final corrective measures for overburden groundwater are the combination of overburden groundwater migration control with a groundwater use restriction at the Facility and continued implementation of the Facility's excavation policy. Together, this combination of an active technology, which has proven successful as an interim measure, and institutional controls at the Facility is most appropriate. In addition, the recommended corrective measure utilizes existing infrastructure.

5.4.2 Bedrock Groundwater

Three active technology alternatives were evaluated for additional corrective measures for bedrock groundwater; namely pump-and-treat, enhanced anaerobic bioremediation through injection of amendment, and migration control through continuation with the existing interim measure for bedrock groundwater migration control (GWMC).

5.4.2.1 Groundwater Restoration by Pump-and-Treat

Pump-and-treat technology, a representative groundwater restoration technology, is one of the most widely used groundwater remediation technologies and is used primarily to accomplish hydraulic containment and groundwater treatment. Hydraulic containment controls the movement of contaminated groundwater to prevent expansion of the contaminated zone. Groundwater treatment reduces the dissolved contaminant concentrations in groundwater. Hydraulic containment and aquifer restoration can represent separate goals, or undertaken to achieve a combination of both. However, if restoration is not feasible, then the primary objective is containment. Aquifer restoration is not likely feasible by pump-and-treat due to contaminant-related limitations of DNAPL trapped below the water table. Such limitations will directly impact the effectiveness of pump-and-treat.

The major components of a pump-and-treat system necessary to address off-Facility bedrock groundwater plume over a 1.7 square mile area include groundwater extraction, above-ground treatment, discharge of treated water, groundwater monitoring and process monitoring in the treatment system. Ongoing evaluation of pump-and-treat systems generally includes the following:

- Evaluate plume capture or hydraulic containment
- Perform and interpret treatment processes monitoring data
- Perform groundwater monitoring and interpret monitoring data
- Evaluate extraction well performance

For the pump-and-treat alternative, a conceptual system design was developed consisting of the following components:

- Drill and install 11 additional off-site pumping wells (8-inch diameter, 100-feet deep) east and southeast of the Facility.
- Pump wells (variably at 15 gpm to 40 gpm) to achieve 20-feet aquifer drawdown over 1.7 square mile (1,100 acres) area.
- Construct four treatment buildings, one on site and three off site, to house water treatment and control equipment.
- Connect pumping wells to treatment buildings via underground piping.
- Off-site pumping wells and treatment buildings will be located in commercial, agricultural, undeveloped/wooded, and residential land use areas. Numerous access agreements, easements and right-of-way agreements will be necessary for wells, buildings and pipelines. Electrical utilities will also be required at wells and treatment buildings.
- Treat water with filtration for solids and carbon adsorption for organics; in addition, treatment at the on-site treatment building will include an air stripper. Note that air stripping is not proposed for water treatment at off-site locations because of community acceptance considerations.
- Discharge treated water through NPDES Permits to nearby tributaries
- Monitor and evaluate extraction wells, treatment processes and groundwater.

The implementation schedule is estimated at approximately one year for design, permitting, access agreements/easements/right-of-way, and pre-construction planning. The subsequent construction schedule is estimated at approximately 1 to 1-1/2 years for installation of electrical utilities, building foundations, drilling extraction wells, trenching waterlines, erection of treatment buildings, installation of mechanical equipment, and start-up.

Long-term operation and maintenance will be required for the mechanical and electrical pumping, conveyance and treatment systems; the extraction wells; and the groundwater monitoring network. Periodic evaluation will be required for the extraction system, the treatment processes and the monitoring program.

With regard to threshold criteria, this technology will take time to achieve restoration for unrestricted groundwater use, if ever. This technology potentially attains media cleanup objectives in time because groundwater with constituents above unacceptable levels is withdrawn and treated. Historical releases to groundwater have been eliminated to the extent practicable; residual DNAPL remains but further removal is technically impracticable. Therefore, plume management and exposure controls are necessary to mitigate risks associated with continued contribution to the dissolved phase groundwater contamination.

With regard to balancing criteria, this technology has high long-term reliability and has been demonstrated through widespread use to be effective in certain site settings. This technology results in a medium reduction of waste volume because constituents are withdrawn for ex-situ treatment. This technology has low short-term effectiveness because of the longer amount of time for design, permitting and implementation. This technology is considered difficult to implement because of the numerous access issues, easements and permits required for installation over a 1.7 square mile area of mixed land uses. This technology has high cost. This technology is anticipated to have low community acceptance because of intensive construction in the neighborhood, treatment in the neighborhood, aesthetics, noise, restrictions on future land development, management of spent carbon in the neighborhood, continuing operations and maintenance in the neighborhood, perceived risk from emissions and discharges, security, and lighting, all of which the neighborhood residents will have to endure for some time.

5.4.2.2 Groundwater Restoration by Enhanced Anaerobic Bioremediation

Enhanced anaerobic bioremediation, a representative in-situ groundwater restoration technology, is the practice of adding hydrogen, an electron donor, to groundwater to increase the number and vitality of indigenous microorganisms that perform bioremediation through reductive dechlorination. The amendments are injected through wellpoints along an array of linear barriers. These injected amendments can accelerate natural degradation rates through an in-situ treatment process. Supplemental amendments can be added over time, if necessary. A number of hydrogen releasing amendments are available; a representative amendment was selected for evaluation.

The representative injection amendment that was evaluated for this corrective measures proposal is produced by REGENESIS as an advanced formula of its Hydrogen Release Compound known as HRC Advanced™. HRC Advanced™ was designed specifically for in-situ treatment of chlorinated compounds. The product incorporates HRC® patented

technology in addition to a new patented molecule (patent pending) specifically designed to time-release a combination of efficient electron donors. The product was also designed with a relatively high hydrophilic/lipophilic balance that allows dilute suspensions to be well distributed across affected areas without increasing injection costs. Upon its injection to the subsurface, HRC Advanced™ produces hydrogen and distributes hydrogen-generating compounds through a series of hydration and fermentation reactions. This process provides an immediate as well as time-release supply of hydrogen to fuel the reductive dechlorination process. Typical longevity for HRC Advanced™ is up to two years for a single injection; under optimal conditions, longevity may be up to four years or longer.

The major components of an enhanced anaerobic biodegradation program implemented over a 1.7 square mile area include drilling and installation of numerous injection wellpoints, mixing the concentrated amendment with water, injection of the amendment mixture, and subsequent groundwater monitoring. Wellpoints may be left open if subsequent amendment injection is anticipated. Wellpoints are grouted after the final injection.

For the enhanced anaerobic biodegradation alternative, a conceptual design was developed consisting of the following components:

- Drill and install injection wellpoints (2-inch diameter, 80-feet deep, one-foot injection interval) in an array off site east and southeast of the Facility.
- The array consists of linear barriers 1,200 to 1,500 feet long, spaced 300 feet apart, with injection points on 50-feet centers. Barriers are oriented perpendicular to the direction of groundwater flow. Total of 1,514 injection wellpoints will be installed.
- Single injection of 473,000 pounds of HRC Advanced™; need for subsequent injection(s) will be evaluated based on monitoring.
- Injection array will be located in commercial, agricultural, undeveloped/wooded, and residential land use areas. Numerous access agreements will be necessary to install multitude of injection wellpoints.
- Injection wellpoints will be grouted for closure after final injection.

Periodic evaluation of the groundwater monitoring program will be required. Subsequent injection(s) may be required.

With regard to threshold criteria, this technology will take time to restore groundwater for unrestricted use, if ever. This technology potentially attains media cleanup objectives in time because groundwater with constituents above unacceptable levels is treated in situ. Historical releases to groundwater have been eliminated to the extent practicable; residual DNAPL remains but removal is technically not practicable. Therefore, plume management and exposure controls are necessary to mitigate risks associated with continued contribution to the dissolved phase groundwater contamination.

With regard to balancing criteria, this technology has medium long-term reliability and effectiveness because it is an in-situ treatment method and depends on delivery of amendments to groundwater. This technology results in medium reduction of waste volume because constituents are degraded over time. This technology has low short-term effectiveness because of the longer amount of time for design and implementation. This technology is considered difficult to implement because of the numerous access issues, easements and

permits required for installation of 1,514 injection wellpoints over a 1.7 square mile area of mixed land uses. This technology has high cost. This technology is anticipated to have low community acceptance because of intensive off-site construction throughout the neighborhoods, aesthetics, noise, and possible restrictions on future land development.

5.4.2.3 Bedrock Groundwater Migration Control

This corrective measures alternative was evaluated to address potential future risks to existing on- and off-site contamination of the bedrock aquifer. Both the RFI risk assessment and Environmental Indicator reports concluded that off-site residential and routine worker exposures to VOCs in bedrock groundwater are currently under control. However, the potential exists for significant exposures from the use of bedrock groundwater if groundwater having concentrations in excess of relevant use criteria (i.e., potable or non-potable criteria) migrates to locations where groundwater is used, or new wells are installed at locations where bedrock concentrations exceed the relevant use criteria.

As discussed in Section 1.5.1, the bedrock migration control IM has been very effective in minimizing further off-site migration of Facility-related constituents. Figure 16 presents the average daily VOC mass removal and cumulative VOC mass removal of the bedrock migration control system since start-up. The localized area of impact in the Top of Rock hydrostratigraphic unit continues to be captured by the passive connection to the Deep Rock ("Sugar Rock") unit below. In addition, concentrations in wells downgradient from the recovery system have decreased by up to four orders of magnitude. Of the 33 Sugar Rock wells on which a Mann-Kendall trend analysis was performed (Appendix A), 26 or 79% of these wells have shown a decreasing trend in TCE concentration since the migration control system was initiated. The seven wells with data that do not show decreasing trends in VOC concentration include MW-407D, MW-422D, MW-424D, MW-438D, MW-441D, MW-451D, MW-453D. As indicated by analysis presented in Appendix A, concentrations in these wells have remained relatively stable.

Notwithstanding the effectiveness of the existing system, there remains a substantial off-site area of groundwater that is affected by the presence of VOCs, primarily TCE and its breakdown products of cis-1,2-dichloroethene and vinyl chloride, at concentrations above drinking water standards. This irregular-shaped area extends approximately 1 mile east of the Facility and 1.5 miles to the southeast, covering approximately 430 acres.

This corrective measures alternative for bedrock groundwater impacted by VOCs includes continued operation of the existing bedrock groundwater migration control system, continued monitoring of plume conditions both in Top of Rock and Sugar Rock monitoring wells to ensure plume stability and implementation of groundwater use ICs. The system and operating conditions may be modified based on monitoring results.

The migration control system will continue to be operated in the same effective manner that it has been since 2000. Groundwater monitoring will continue in accordance with an updated Monitoring Plan presented in Section 6, with periodic reporting to USEPA. (This plan continues to meet the requirements of the RCRA CA750 verification sampling.) Several institutional controls have already been established. Deeds have been modified for 17 residential properties along Cassel Road. Delphi will also modify its deed for property they

currently own. In addition, Delphi is working with the City of Vandalia, where municipal water is readily available, to develop a City ordinance that would prohibit new groundwater production wells from being installed in the offsite area of impact. Delphi has assisted the City with drafting ordinance language and is supporting their efforts to put the ordinance in place. Similar use restrictions will be pursued with Butler Township for potentially impacted areas on the west side of Engle Road. It is assumed that the existing Administrative Order on Consent or an implementation order will be amended/established to reflect environmental covenants related to these groundwater use restrictions pursuant to the Ohio Environmental Covenants Act (Ohio Revised Code 5301.80 - 5301.92).

It is recognized that for institutional controls to remain effective, their application must be periodically monitored and verified. The long term operation and maintenance plan for the bedrock groundwater corrective measure will include: annual inspection of the controlled area and review of ODNR well reports to identify new well installations. Every five years, deeds with previously established restrictions will be reviewed to confirm that restrictive elements remain and a public advisory will be distributed to remind residents of the ordinance that restricts groundwater use.

With regard to threshold criteria, this corrective measures alternative to address bedrock groundwater is protective of human health and the environment. The human health and ecological risk assessments presented in the RFI confirmed that the existing system creates conditions that are protective under current and future scenarios except unrestricted potable use. Institutional controls will mitigate potential future risks to human health associated with potential development of unrestricted potable water use.

This alternative attains media cleanup objectives because risk-based cleanup standards based on nonpotable use of groundwater have already been achieved off-site. Institutional controls that are expected to be implemented as part of the corrective measures will prohibit installation of new drinking water wells, and continued monitoring will ensure that existing drinking water wells remain usable.

As discussed previously, the current source of dissolved-phase VOCs in bedrock groundwater is likely residual DNAPL present at depth in both the Top of Rock and Sugar Rock hydrostratigraphic units. The original source of this DNAPL, likely historical releases from USTs, has been mitigated. The USTs were removed more than 10 years ago and recoverable/potentially mobile DNAPL has been recovered. The absence of certain VOCs (e.g. 1,1,1-trichloroethane) in bedrock groundwater indicates that shallow residual DNAPL that contain these constituents is no longer a source contributing to the bedrock groundwater dissolved-phase plume. In addition, the existing groundwater migration control system effectively intercepts dissolved phase constituents and inhibits their further migration off-site. These factors combine to control the source of the release.

With respect to balancing criteria, the long-term reliability and effectiveness of the migration control system have been demonstrated by system performance to date. The proposed long term monitoring, operation and maintenance will provide further assurance of continued reliability of both the migration control system and institutional controls.

The existing migration control system intercepts VOCs migrating in groundwater at the Facility boundary controlling the mobility and volume of the "wastes". The short-term effectiveness and implementability of the existing system is clearly documented in the RSE, RCRA CA750, and RFI reports. This technology has medium cost associated with ongoing monitoring. Several institutional controls, in the form of deed restrictions, have already been implemented. This technology is anticipated to have high community acceptance because it is not intrusive in the neighborhood, and it effectively controls bedrock groundwater migration.

Institutional Control – Restrict Groundwater Use

With regard to threshold criteria, this IC is protective and attains the media cleanup objectives because it minimizes potentially unacceptable exposures. Historical releases to groundwater have been eliminated to the extent practicable; residual DNAPL remains but removal is technically not practicable. Therefore, plume management and exposure controls are necessary for source control.

With respect to balancing criteria, this IC has medium long-term reliability and effectiveness because of difficulty enforcing numerous proprietary ICs. This IC results in low reduction of waste. This IC has high short-term effectiveness because of the short amount of time to implement and take effect. This IC has moderate implementability because of coordination with local zoning officials. This IC has low cost. Community acceptance is anticipated to be high for this IC because of low neighborhood impacts and discussions with community leaders.

Recommended Final Corrective Measures Bedrock Groundwater

Based on the preceding evaluation, the recommended final corrective measures for bedrock groundwater are the combination of bedrock groundwater migration control with a groundwater use restriction at the Facility and in the surrounding area through City Ordinance and deed restrictions. Together, this combination of an active groundwater control, which has proven successful as the interim measure, with an institutional control is most appropriate because it utilizes existing infrastructure, does not impose additional construction or intrusion constraints on the community, and is significantly more cost effective than other alternatives. In addition, the recommended corrective action utilizes existing infrastructure, and does not change existing conditions.

6. MONITORING PLAN

6.1 Groundwater, Surface Water and Indoor Air Sampling and Analysis

Groundwater monitoring will continue to be conducted to verify that "contaminated" groundwater remains within the existing areas. Monitoring wells and surface water locations will be sampled on a quarterly, semi-annual, or annual basis for VOCs (Table 3, Figure 14). These locations represent a subset of the locations sampled for the RCRA CA750 determination. This monitoring plan will be followed until such time as it is replaced or modified by future monitoring plans.

6.1.1 Overburden

Specific monitoring wells screened in the water table and First Sand within and downgradient of the "contaminated" areas will continue to be sampled on a quarterly or semi-annual basis to provide data of sufficient quality and quantity to support assessment of "contaminated" groundwater. Data from sampling will also continue to provide assessment of ongoing migration control efforts. Monitoring wells identified as sampling points are MW-512, MW-607, MW-775, MW-776, MW-810, MW-732, MW-730, VPW-103, MW-729, and MW-734.

In addition, sampling will be conducted at monitoring well MW-784 located at the southeast corner of the abandoned storm-water retention basin to provide assessment of groundwater in that portion of the Facility. The well will be monitored on a semi- annual basis.

Implementation of a Second Sand migration control point is planned. This will include the installation of a recovery well near MW-516. Pumping from this well is intended to address increasing concentrations of VOCs at MW-516 and downgradient monitoring well MW-759.

Monitoring of select Second Sand monitoring wells will continue on a quarterly, semi-annual, or annual basis. Second Sand wells within and downgradient of the impacted area are adequate to provide data of sufficient quantity and quality to support assessments of groundwater. Second Sand monitoring wells identified for continued sampling activities are MW-515, MW-516, MW-605, MW-717, MW-725, MW-731, MW-740, MW-741, MW-743, MW-759, MW-800, MW-809, and MW-812. Alterations to the frequency of sampling will be made at monitoring wells MW-812 and MW-515 from semi-annual to annual sampling.

6.1.2 Top of Rock

Sampling activities conducted on top of rock monitoring wells are planned to continue. Sampling is conducted on a quarterly or semi-annual basis on monitoring wells within and downgradient of "contaminated" groundwater. Monitoring wells identified for continued sampling are MW-301S, MW-401S, MW-425S, MW-426S, MW-445S, MW-446S, and MW-454S. Currently the residence located at 10591 Engle Road is not occupied. Therefore, no ongoing sampling is planned at this location. Efforts to resume periodic sampling at this location will be made when the residence is occupied. In addition, an annual sample will be collected from the well which supplies the commercial enterprise at 880 Engle Road.

6.1.3 Sugar Rock

Groundwater monitoring in the Sugar Rock will continue within and downgradient of the Facility. Sampling activities are to be conducted on a semi-annual and annual basis to evaluate performance of the groundwater migration control system as well as to continue to monitor plume stability. As presented in Appendix A, Delphi has a long history of groundwater monitoring data for the Sugar Rock. In recognition of this, the sampling frequency in all Sugar Rock wells will be reduced. Wells previously sampled on a quarterly basis will be sampled semi-annually and wells previously sampled semi-annually will be sampled annually. In addition, site-wide water level monitoring will be reduced from monthly to quarterly. Wells that will continue to be sampled are CSX-18D, MW-301D, MW-401D, MW-402D, MW-411D, MW-412D, MW-413D, MW-414D, MW-416D, MW-417D, MW-418D, MW-420D, MW-420M, MW-434D, MW-435D, MW-444D, MW-447D, MW-450D, and MW-453D. Sampling of the water supply well at 10440 Cassel Road will continue on a semi-annual basis.

6.1.4 Surface Water

Surface water sampling will continue at the unnamed tributary of North Creek and at the downgradient Sugar Rock seeps. Sampling will be conducted on a quarterly basis at surface water sampling points SW-1 and SW-4. Sampling will be conducted on a semi-annual basis at the Sugar Rock seeps B005, B006, C001, D001, F001, E001, E002, F001, G003, G004, G005, and G006.

6.1.5 Indoor Air

Indoor air samples will be collected in accordance with industrial hygiene practices in work space nearby AOIs: 15/50, 43, 45, and 49. This sampling will be conducted on an annual basis. If the current use of the building changes, then a new air monitoring plan will be required in accordance with Institutional Controls. If a new building is constructed in an area of potential concern, then the need for continued monitoring will be re-evaluated based on the type of vapor intrusion mitigation that is incorporated into the new building design.

6.1.6 Institutional Controls

It is recognized that for institutional controls to remain effective, their application must be periodically monitored and verified. The long term operation and maintenance plan for the bedrock groundwater corrective measure will include: annual inspection of the controlled area and review of ODNR well reports to identify new well installations. Every five years, deeds with previously established restrictions will be reviewed to confirm that restrictive elements remain and a public advisory will be distributed to remind residents of the ordinance that restricts groundwater use.

The proposed corrective measures for indoor air includes operation of an appropriate HVAC system and implementation of a monitoring plan that conforms to building use. An annual inspection of the impacted areas will be conducted to establish building occupancy, use and HVAC operation. If a change is observed, a review of the air monitoring plan will be

conducted.

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TABLE 1
SUMMARY OF THRESHOLD AND BALANCING CRITERIA
CORRECTIVE MEASURES ALTERNATIVES
DELPHI CORPORATION - VANDALIA, OHIO

AREAS		THRESHOLD CRITERIA			BALANCING CRITERIA					
	CORRECTIVE MEASURES ALTERNATIVES	Protective of Human Health and the Environment	Attain Media Cleanup Objectives	Control Source of Release	Long Term Reliability and Effectiveness	Reduction of Toxicity, Mobility, or Volume of Waste	Short Term Effectiveness	Implementability	Community Acceptance	Cost
Bedrock Groundwater										
	Migration Control		√	√	High	Low	High	Easy	High	$2,960,000
	Pump and Treat		√	√	High	Medium	Low	Difficult	Low	$30,003,000
	Enhanced Anaerobic Bioremediation		√	√	Medium	Medium	Low	Difficult	Low	$30,974,000
	Groundwater Use Restriction	√	√	√	Medium	Low	High	Moderate	High	$57,000
Overburden Groundwater										
	Overburden Migration Control		√	√	High	Low	High	Easy	High	$2,284,000
AOI 15\50										
	Excavation	√	√	√	High	High	High	Moderate	High	$933,000
	SVE	√	√	√	Medium	Medium	Medium	Moderate	High	$671,000
	Operate HVAC (Site)	√	√	√	Medium	Low	High	Easy	High	$88,000
AOI 43										
	Excavation	√	√	√	High	High	High	Moderate	High	$269,000
	Sub-Slab Depressurization	√	√	√	Medium	Low	Medium	Easy	High	$158,000
	Operate HVAC (Site)	√	√	√	Medium	Low	High	Easy	High	$88,000
AOI 45										
	Excavation	√	√	√	High	High	High	Moderate	High	$1,127,000
	Sub-Slab Depressurization	√	√	√	Medium	Low	Medium	Easy	High	$192,000
	Operate HVAC (Site)	√	√	√	Medium	Low	High	Easy	High	$88,000

Notes:
1) Criteria defined in Section 3 of RCRA CMP
2) Cost detailed on Table 2

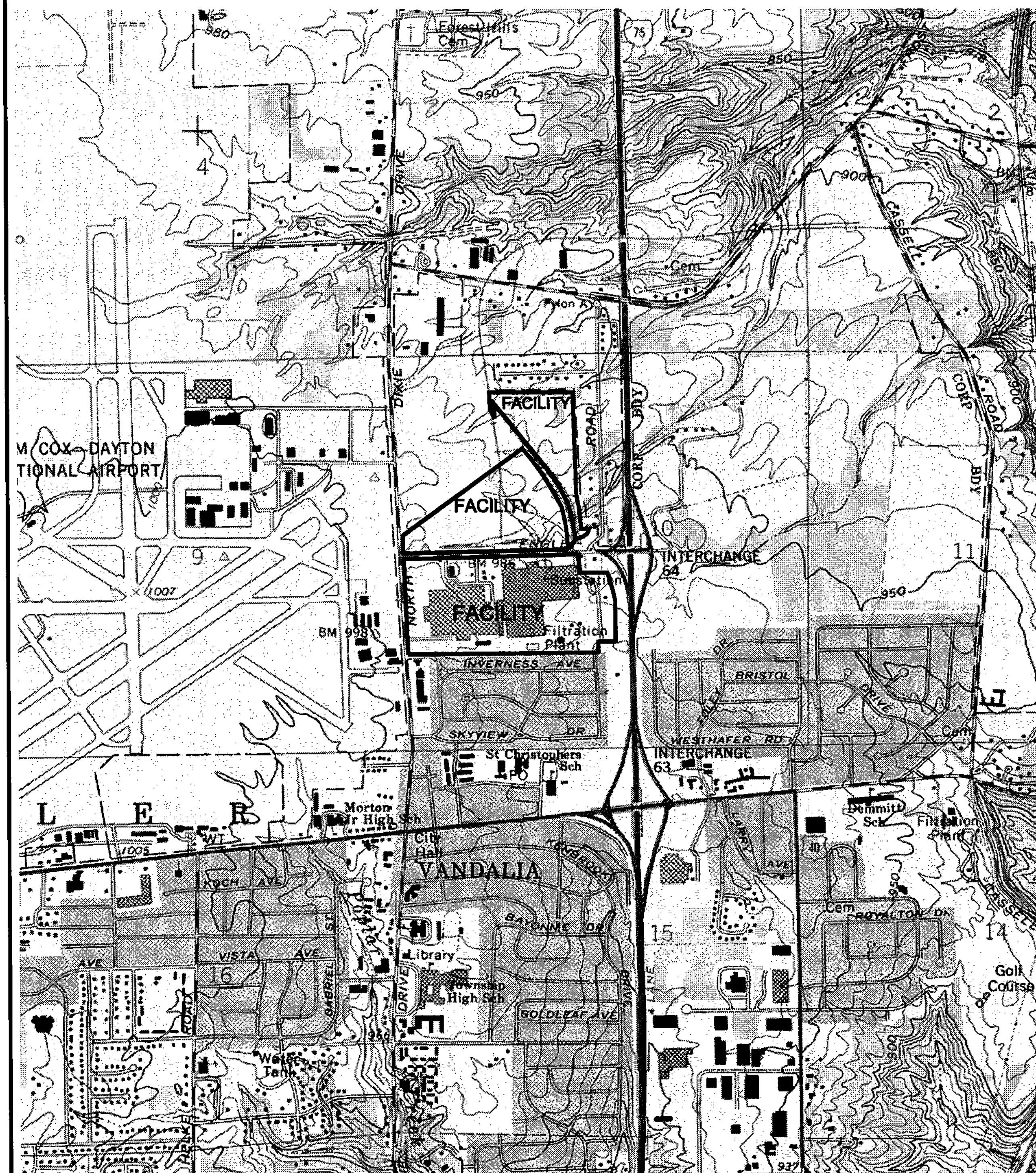
TABLE 2
SUMMARY OF COST EVALUATION
CORRECTIVE MEASURES ALTERNATIVES
DELPHI CORPORATION - VANDALIA, OHIO

AREAS		CAPITAL COSTS (CONSTRUCTION)						OPERATIONS AND MAINTENANCE COSTS (O&M)				
	CORRECTIVE MEASURES ALTERNATIVES	General Conditions	Design Engineering\ Oversight	Site Civil	System Installation\ Excavation	Contingency	Sub Total	Annual Personnel and Materials	Expected Time Frame (Years)	Sub Total NPV of Expected Time Frame	Total	Comment
Bedrock Groundwater												
	Migration Control	$0	$0	$0	$0	$0	$0	$180,000	20	$2,959,871	$2,960,000	Includes bedrock groundwater sampling\monitoring costs
	Pump and Treat	$60,000	$486,000	$956,896	$1,082,852	$775,724	$3,361,000	$1,620,200	20	$26,642,127	$30,003,000	Includes bedrock groundwater sampling\monitoring costs
	Enhanced Anaerobic Bioremediation	$10,000	$2,328,176	$2,952,300	$20,319,460	$4,656,352	$30,266,000	$150,000	5	$708,211	$30,974,000	Includes O&M at $50,000/year plus groundwater sampling\monitoring costs
	Groundwater Use Restriction	$20,000	$0	$0	$0	$4,000	$24,000	$2,000	20	$32,887	$57,000	
Overburden Groundwater												
	Overburden Migration Control	$25,000	$83,000	$50,000	$100,000	$51,600	$310,000	$120,000	20	$1,973,248	$2,284,000	
AOI 15\50												
	Excavation	$30,000	$133,318	$257,200	$379,388	$133,318	$933,000	$0	0	$0	$933,000	
	SVE	$2,000	$22,418	$13,870	$96,218	$22,418	$157,000	$31,237	20	$513,652	$671,000	Includes $5,225 per year for indoor air monitoring over 20 years
	Operate HVAC (Site)	$0	$0	$0	$0	$0	$0	$7,175	1	$87,868	$88,000	Includes $5,225 per year for indoor air monitoring over 20 years
AOI 43												
	Excavation	$30,000	$38,498	$92,650	$69,838	$38,498	$269,000	$0	0	$0	$269,000	
	Sub-Slab Depressurization	$2,000	$2,790	$2,930	$9,020	$2,930	$20,000	$8,420	20	$138,439	$158,000	Includes $5,225 per year for indoor air monitoring over 20 years
	Operate HVAC (Site)	$0	$0	$0	$0	$0	$0	$7,175	1	$87,868	$88,000	Includes $5,225 per year for indoor air monitoring over 20 years
AOI 45												
	Excavation	$30,000	$160,950	$397,250	$377,500	$160,950	$1,127,000	$0	0	$0	$1,127,000	
	Sub-Slab Depressurization	$1,240	$4,836	$5,019	$19,019	$5,019	$35,000	$9,578	20	$157,498	$192,000	Includes $5,225 per year for indoor air monitoring over 20 years
	Operate HVAC (Site)	$0	$0	$0	$0	$0	$0	$7,175	1	$87,868	$88,000	Includes $5,225 per year for indoor air monitoring over 20 years

Notes:
1) Assumes bedrock groundwater migration control in-place.
2) Examples of General Conditions include Mobe, H&S, obtaining\recording IC\restrictions

TABLE 3
SAMPLING SUMMARY
DELPHI CORPORATION - VANDALIA, OHIO

Location	Location ID	Unit	Frequency
Water Table and/or First Sand			
MW-512	W512	WT	Quarterly
MW-607	W607	WT/S1	Quarterly
MW-729	W729	WT/S1	Semiannaully
MW-734	W734	WT/S1	Quarterly
MW-775	W775	WT/S1	Quarterly
MW-776	W776	WT/S1	Quarterly
MW-810	W810	WT	Quarterly
VPW-103	V103	WT/S1	Semiannaully
MW-730	W730	S1	Semiannaully
MW-732	W732	S1	Quarterly
MW-784	W784	WT	Semiannaully
Second Sand			
MW-515	W515	S2	Annually
MW-516	W516	S2	Quarterly
MW-605	W-605	S2	Quarterly
MW-717	W717	S2	Semiannaully
MW-725	W725	S2	Semiannaully
MW-731	W731	S2	Semiannaully
MW-740	W740	S2	Quarterly
MW-741	W741	S2	Quarterly
MW-743	W743	S2	Semiannaully
MW-759	W759	S2	Quarterly
MW-800	W800	S2	Quarterly
MW-809	W809	S1/S2	Semiannaully
MW-812	W812	S2	Annually
Top of Bedrock			
MW-301S	301S	TOR	Semiannaully
MW-401S	401S	TOR	Semiannaully
MW-425S	425S	TOR	Quarterly
MW-426S	426S	TOR	Semiannaully
MW-445S	445S	TOR	Quarterly
MW-446S	446S	TOR	Semiannaully
MW-454S	454S	TOR	Semiannaully
Sugar Rock			
CSX-18D	C18D	SR	Annually
MW-301D	301D	SR	Semiannually
MW-401D	401D	SR	Annually
MW-402D	402D	SR	Annually
MW-411D	411D	SR	Annually
MW-412D	412D	SR	Annually
MW-413D	413D	SR	Semiannually
MW-414D	414D	SR	Semiannually
MW-416D	416D	SR	Semiannually
MW-417D	417D	SR	Semiannually
MW-418D	418D	SR	Semiannually
MW-420D	420D	SR	Semiannually
MW-420M	420M	SR	Semiannually
MW-434D	434D	SR	Annually
MW-435D	435D	SR	Annually
MW-444D	444D	SR	Annually
MW-447D	447D	SR	Annually
MW-450D	450D	SR	Annually
MW-453D	453D	SR	Annually
Surface Water			
B005	B005	Sugar Rock Spring	Semiannually
B006	B006	Sugar Rock Spring	Semiannually
C001	C001	Sugar Rock Spring	Semiannually
D001	D001	Sugar Rock Spring	Semiannually
E001	E001	Sugar Rock Spring	Semiannually
E002	E002	Sugar Rock Spring	Semiannually
F001	F001	Sugar Rock Spring	Semiannually
G003	G003	Sugar Rock Spring	Semiannually
G004	G004	Sugar Rock Spring	Semiannually
G005	G005	Sugar Rock Spring	Semiannually
G006	G006	Sugar Rock Spring	Semiannually
SW-1	SW01	Unnamed tributary to North Creek	Quarterly
SW-4	SW04	Unnamed tributary to North Creek	Quarterly



del\projects\79022\acad\project_locus.dwg

USGS QUADRANGLE:
TIPP CITY, OHIO

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

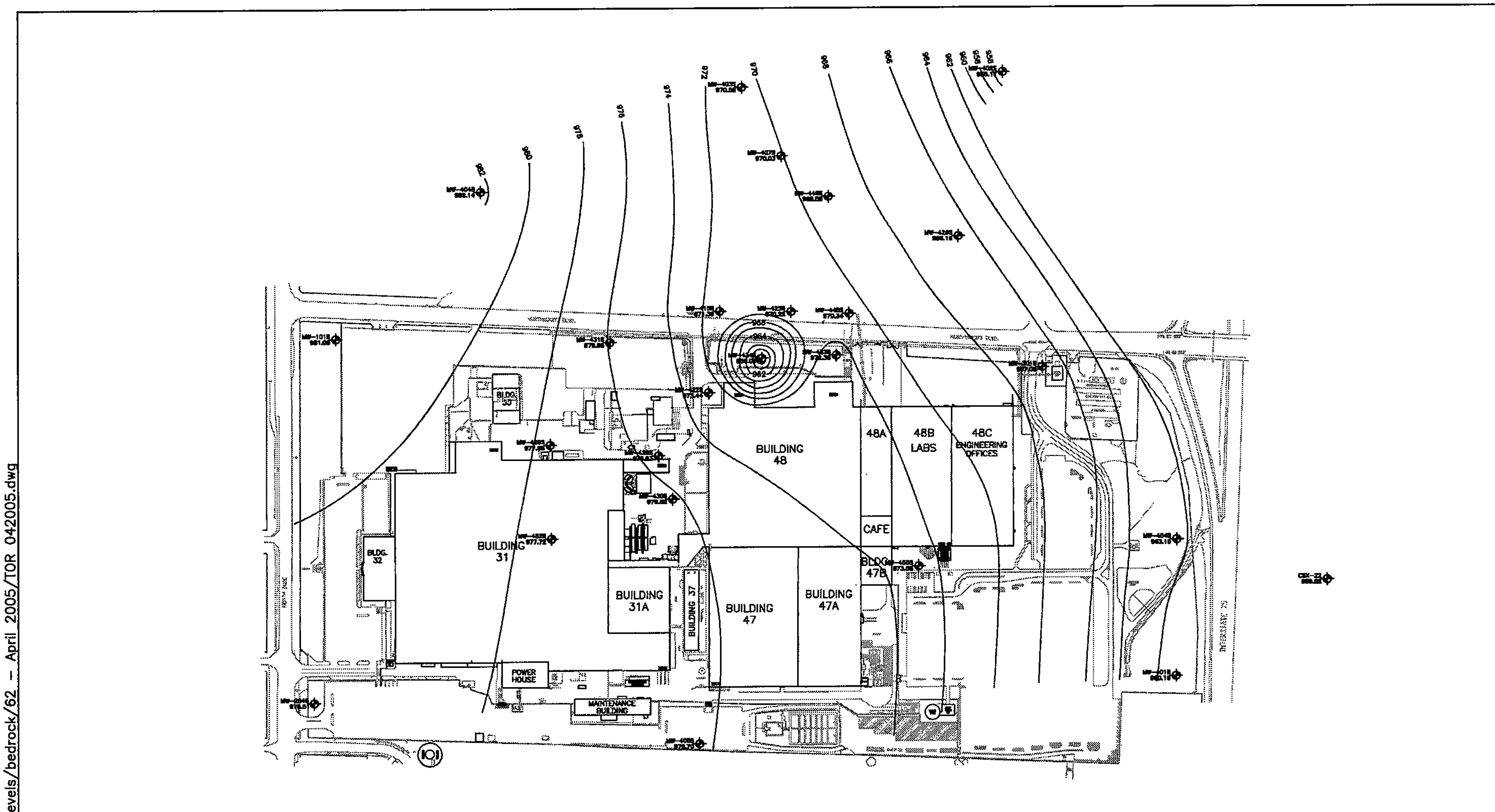
DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

PROJECT LOCUS

SCALE: 1 INCH = 2,000 FEET

APRIL 2002

FIGURE 1



LEGEND

- MONITORING WELL OR PIEZOMETER WITH GROUNDWATER ELEVATION
- 980 POTENTIOMETRIC SURFACE CONTOUR WITH ELEVATION IN FEET
- UNNAMED TRIBUTARY OF NORTH CREEK
- MONITORING WELL NOT ACCESSIBLE DUE TO ACCESS RESTRICTIONS

NOTES:

1. WATER LEVELS FROM MONITORING WELLS, PIEZOMETERS OR OTHER SOURCES USED FOR THIS PLAN WERE OBSERVED ON THE DATE INDICATED.
2. INDICATED LEVELS MAY NOT REFLECT THE ACTUAL GROUNDWATER OR POTENTIOMETRIC LEVELS. FLUCTUATIONS IN GROUNDWATER LEVELS CAN OCCUR DUE TO CLIMATIC CHANGES, AREA PUMPING ACTIVITY AND OTHER REASONS.
3. POTIENTIOMETRIC CONTOUR LINES ARE BASED UPON INTERPOLATION BETWEEN OBSERVATION POINTS AND MAY NOT ACCURATELY DEPICT THE POTIENTIOMETRIC SURFACE AT ALL LOCATIONS OR TIMES.

0 300 600 900
SCALE IN FEET

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DELPHI CORPORATION
DELPHI ENERGY & CHASSIS SYSTEMS
SAFETY & INTERIOR SYSTEMS–VANDALIA FACILITY
VANDALIA, OHIO

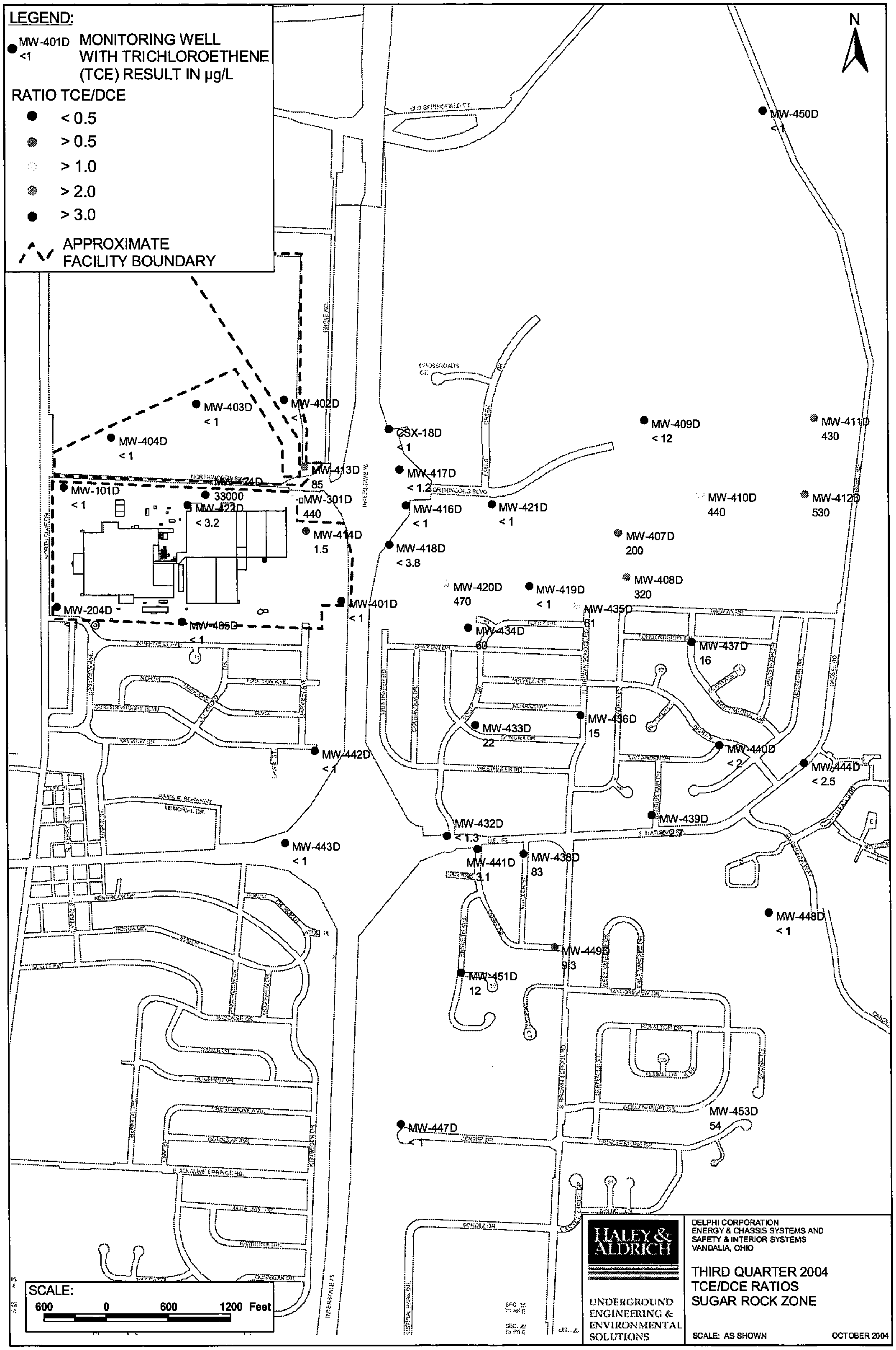
POTENTIOMETRIC SURFACE CONTOURS
20 APRIL 2005
TOP OF ROCK ZONE

SCALE: AS SHOWN

APRIL 2005

FIGURE 2

FILE NO:79022/water levels/bedrock/62 – April 2005/TOR 042005.dwg


LEGEND:
MW-401D <1 MONITORING WELL WITH TRICHLOROETHENE (TCE) RESULT IN µg/L
RATIO TCE/DCE
< 0.5
> 0.5
> 1.0
> 2.0
> 3.0
APPROXIMATE FACILITY BOUNDARY
N
MW-450D < 1
MW-403D < 1
MW-402D
MW-404D < 1
CSX-18D < 1
MW-409D < 12
MW-411D 430
MW-413D 85
MW-417D < 1.2
MW-101D < 1
MW-424D 33000
MW-301D 440
MW-422D < 3.2
MW-416D < 1
MW-421D < 1
MW-410D 440
MW-412D 530
MW-414D 1.5
MW-418D < 3.8
MW-407D 200
MW-420D 470
MW-419D < 1
MW-408D 320
MW-204D
MW-401D < 1
MW-405D < 1
MW-435D 61
MW-434D 60
MW-437D 16
MW-436D 15
MW-433D 22
MW-442D < 1
MW-440D < 2
MW-444D < 2.5
MW-439D < 2.7
MW-432D < 1.3
MW-443D < 1
MW-441D < 3.1
MW-438D 83
MW-448D < 1
MW-449D 9.3
MW-451D 12
MW-453D 54
MW-447D < 1
SCALE:
600 0 600 1200 Feet
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UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS
DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO
THIRD QUARTER 2004
TCE/DCE RATIOS
SUGAR ROCK ZONE
SCALE: AS SHOWN
OCTOBER 2004

FIGURE 3

HALEY & ALDRICH

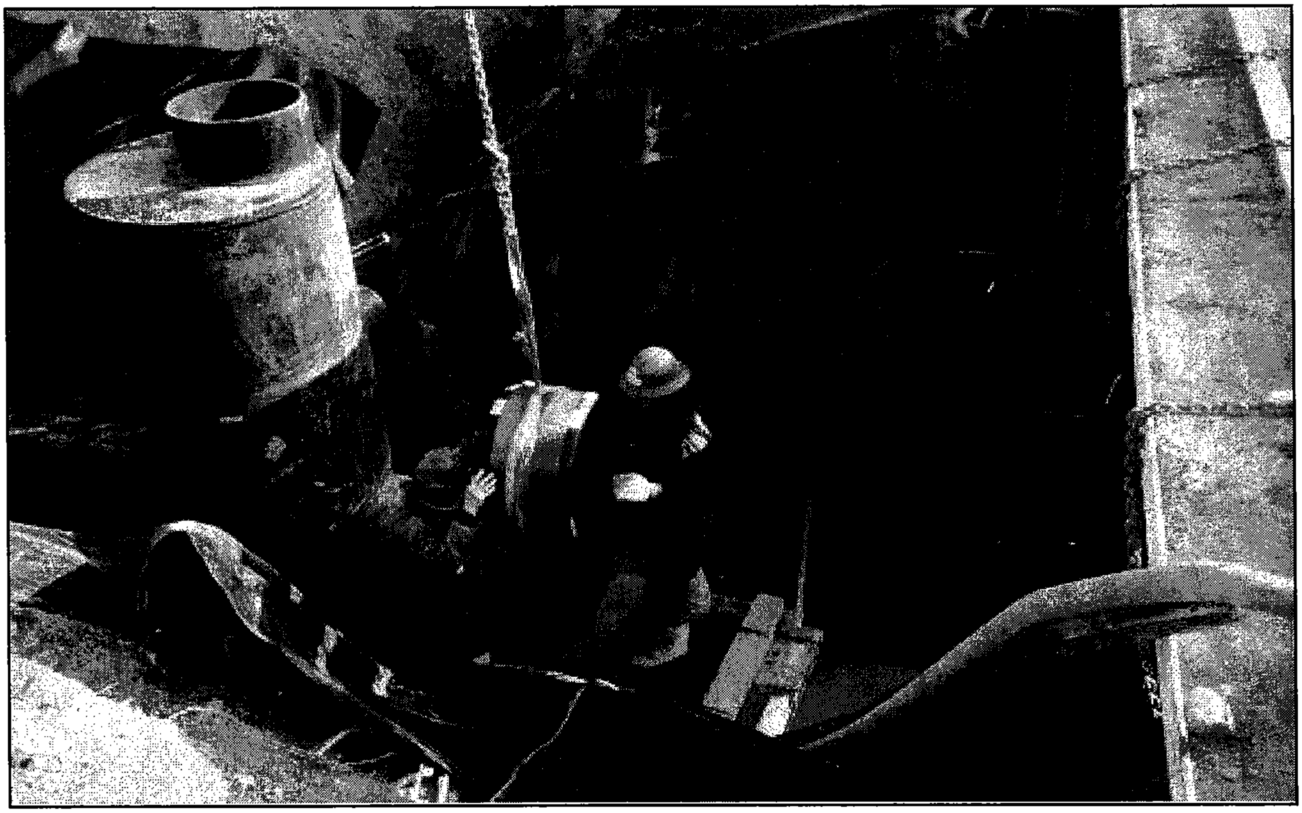
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

LOW PERMEABILITY FILL AROUND NEW PIPE

JANUARY 2006

FIGURE 4



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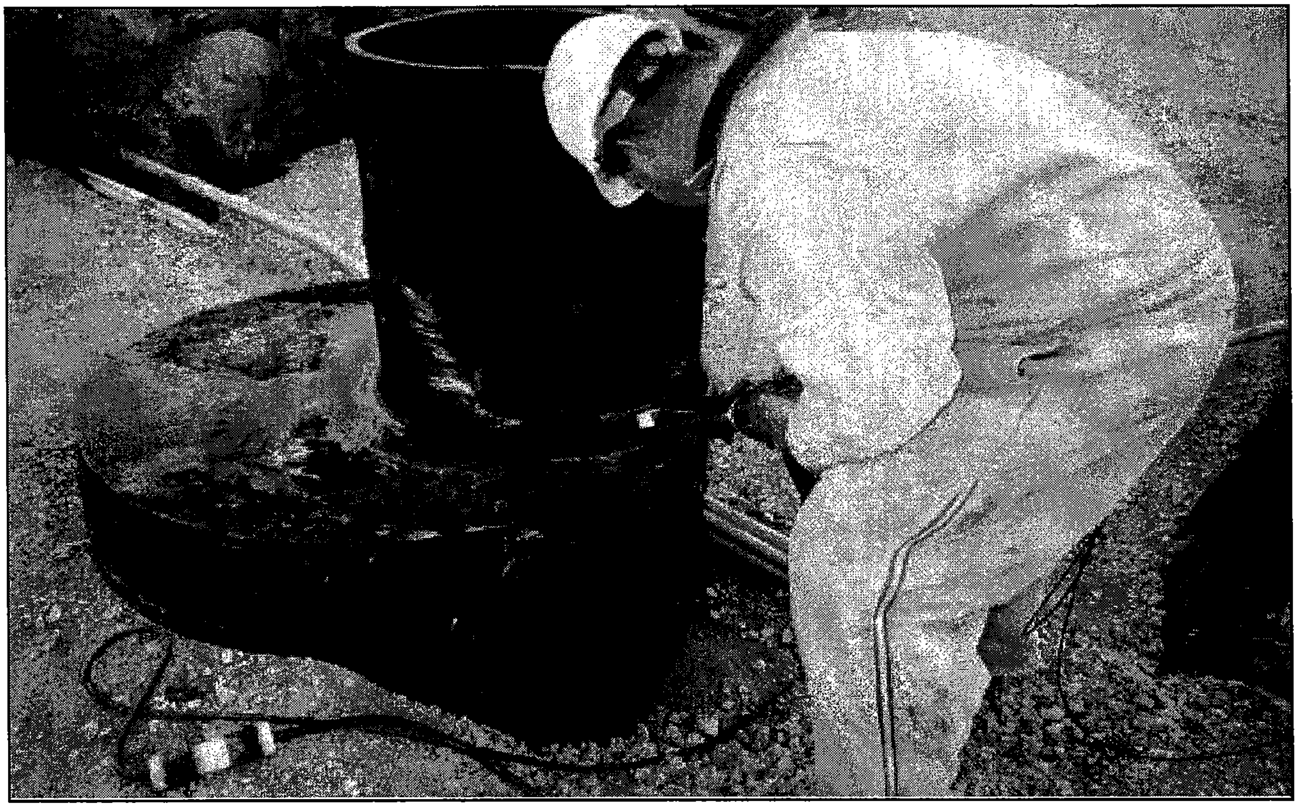
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

HEATED FUSION COUPLER

JANUARY 2006

FIGURE 5



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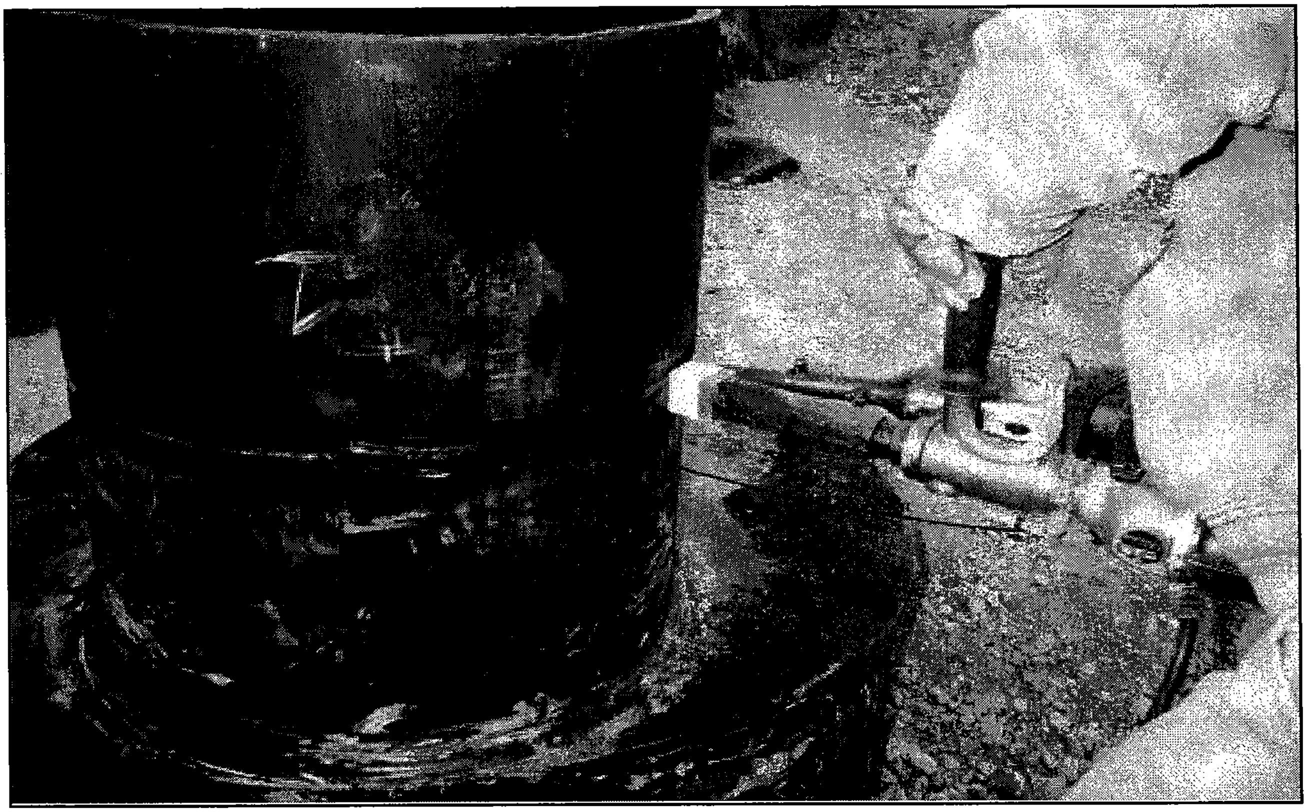
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

PRE-FABRICATED HDPE MANHOLES

JANUARY 2006

FIGURE 6



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UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

EXTRUSION WELDING

JANUARY 2006

FIGURE 7

HALEY & ALDRICH

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

LOW PERMEABILITY FILL AROUND MANHOLE

JANUARY 2006

FIGURE 8

HALEY & ALDRICH

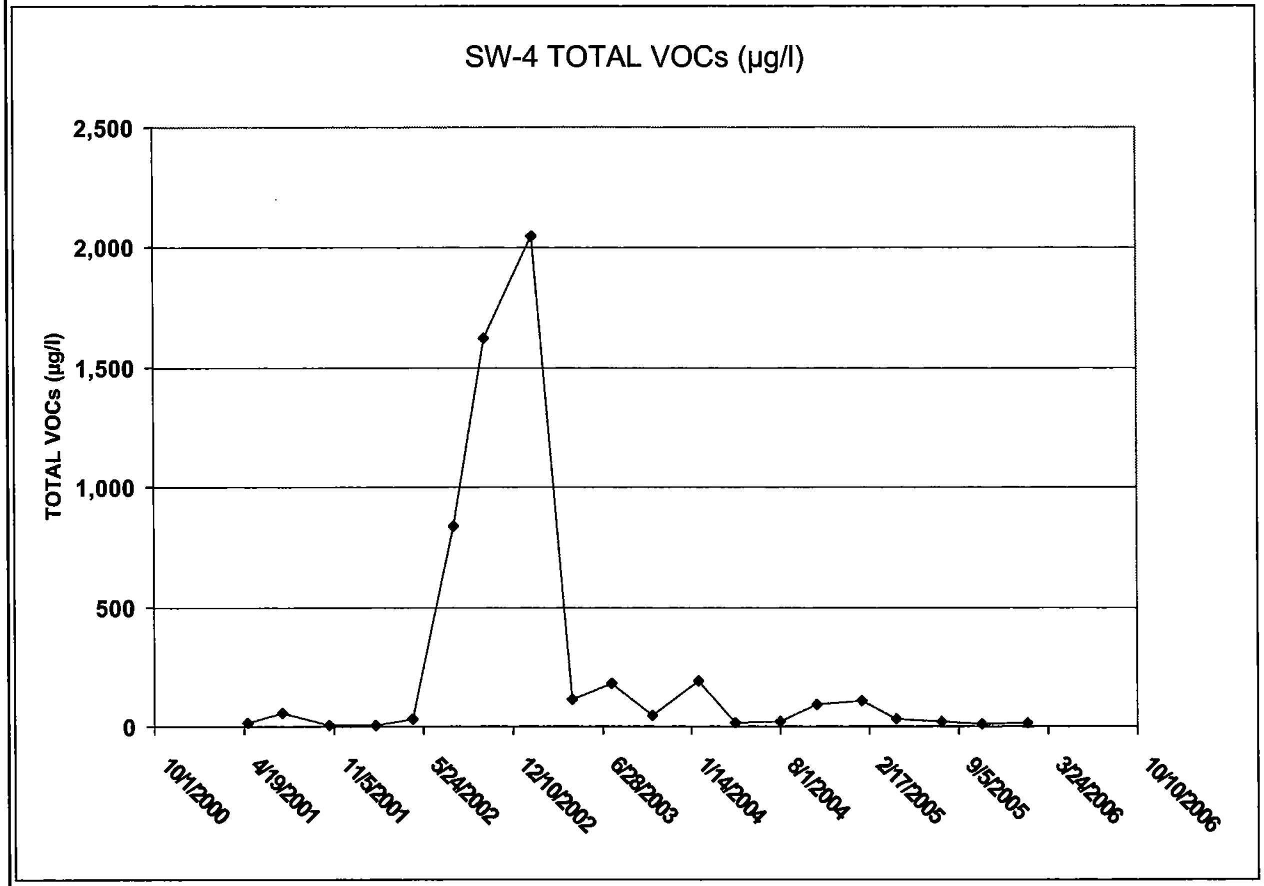
UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

DELPHI CORPORATION
ENERGY & CHASSIS SYSTEMS AND
SAFETY & INTERIOR SYSTEMS
VANDALIA, OHIO

PLACEMENT OF FILL IN HDPE

JANUARY 2006

FIGURE 9



DATE	TOTAL VOCs (µg/l)
4/27/2001	17.6
7/13/2001	54.2
10/25/2001	6.4
2/8/2002	7.4
5/1/2002	29.6
8/2/2002	839.0
10/10/2002	1622.0
1/23/2003	2048.0
4/21/2003	115.5
7/18/2003	179.6
10/17/2003	45.4
1/28/2004	190.7
4/21/2004	13.6
7/30/2004	19.3
10/20/2004	90.1
2/1/2005	107.0
4/18/2005	32.5
7/28/2005	18.1
10/26/2005	9.4
2/6/2006	16.0

LINEAR REGRESSION PERFORMED ON TOTAL VOLATILE ORGANIC COMPOUNDS SINCE SEWER REPLACEMENT INTERIM MEASURE IN FEBRUARY 2001

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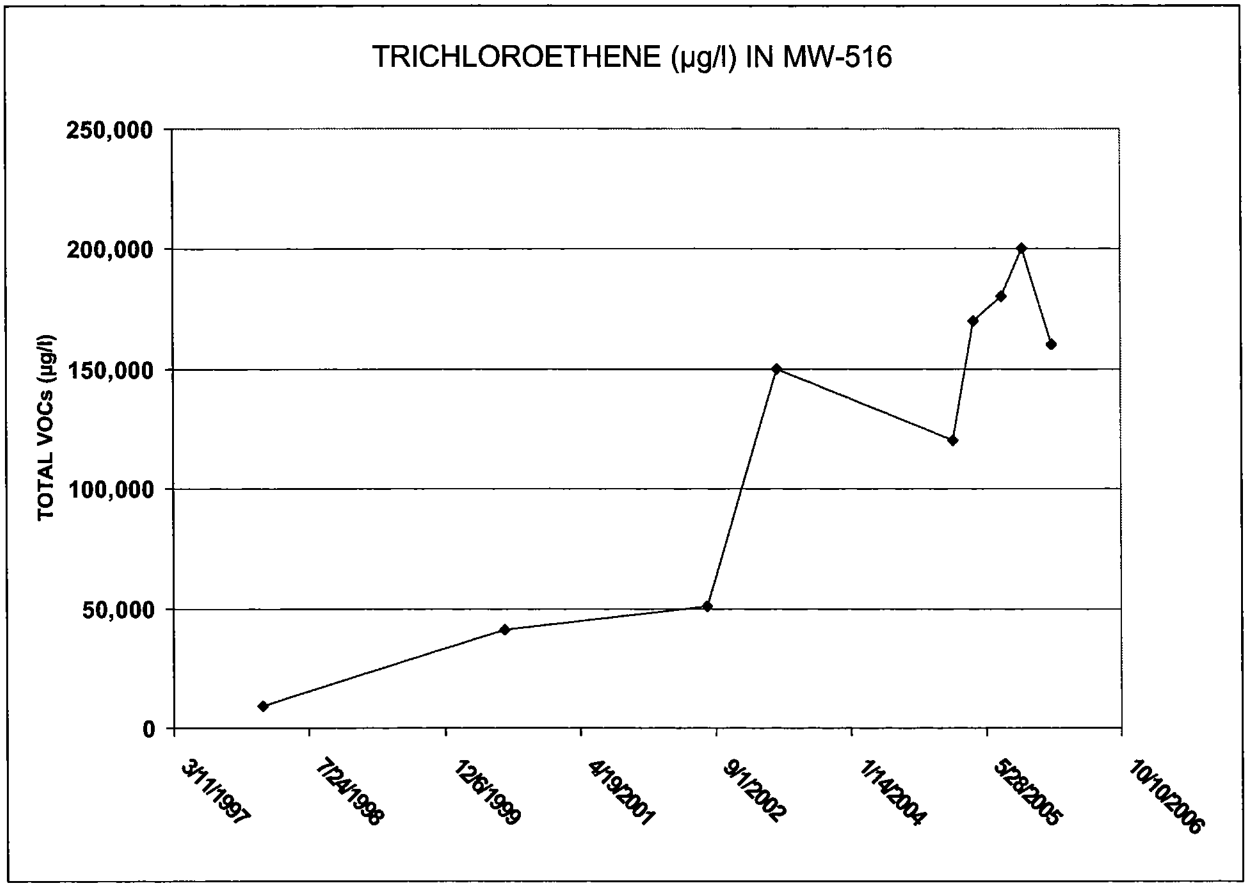
SURFACE WATER SAMPLING LOCATION
SW-4 TOTAL VOCs

MAY 2006

FIGURE 10



DATE	TRICHLOROETHENE (µg/l)
1/30/1998	9200
7/13/2000	40900
7/31/2002	51000
4/18/2003	150000
1/26/2005	120000
4/14/2005	170000
7/26/2005	180000
10/13/2005	200000
1/31/2006	160000

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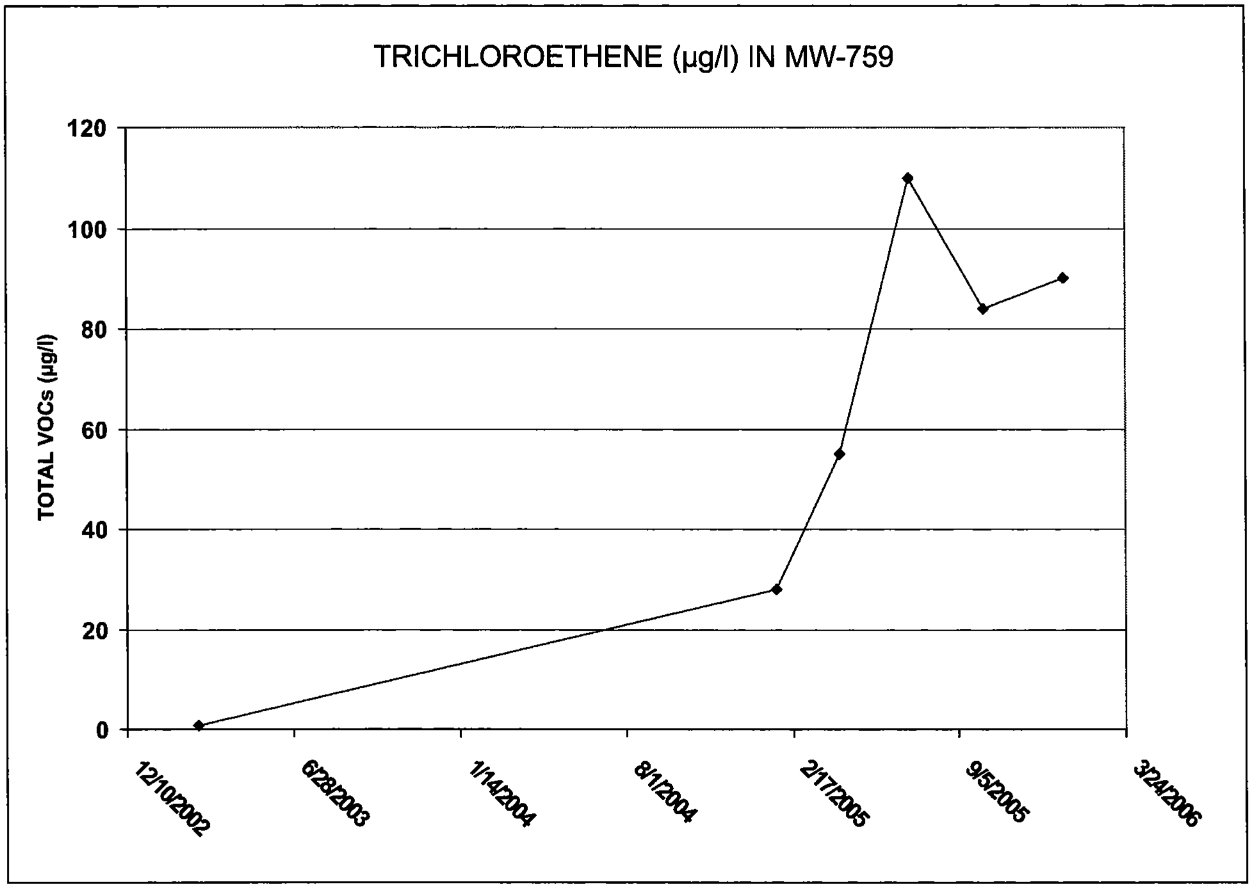
MONITORING WELL MW-516
TRICHLOROETHENE

MAY 2006

FIGURE 11



DATE	TRICHLOROETHENE (µg/l)
3/6/2003	0.7
1/28/2005	28.0
4/14/2005	55.0
7/7/2005	110.0
10/5/2005	84.0
1/10/2006	90.0

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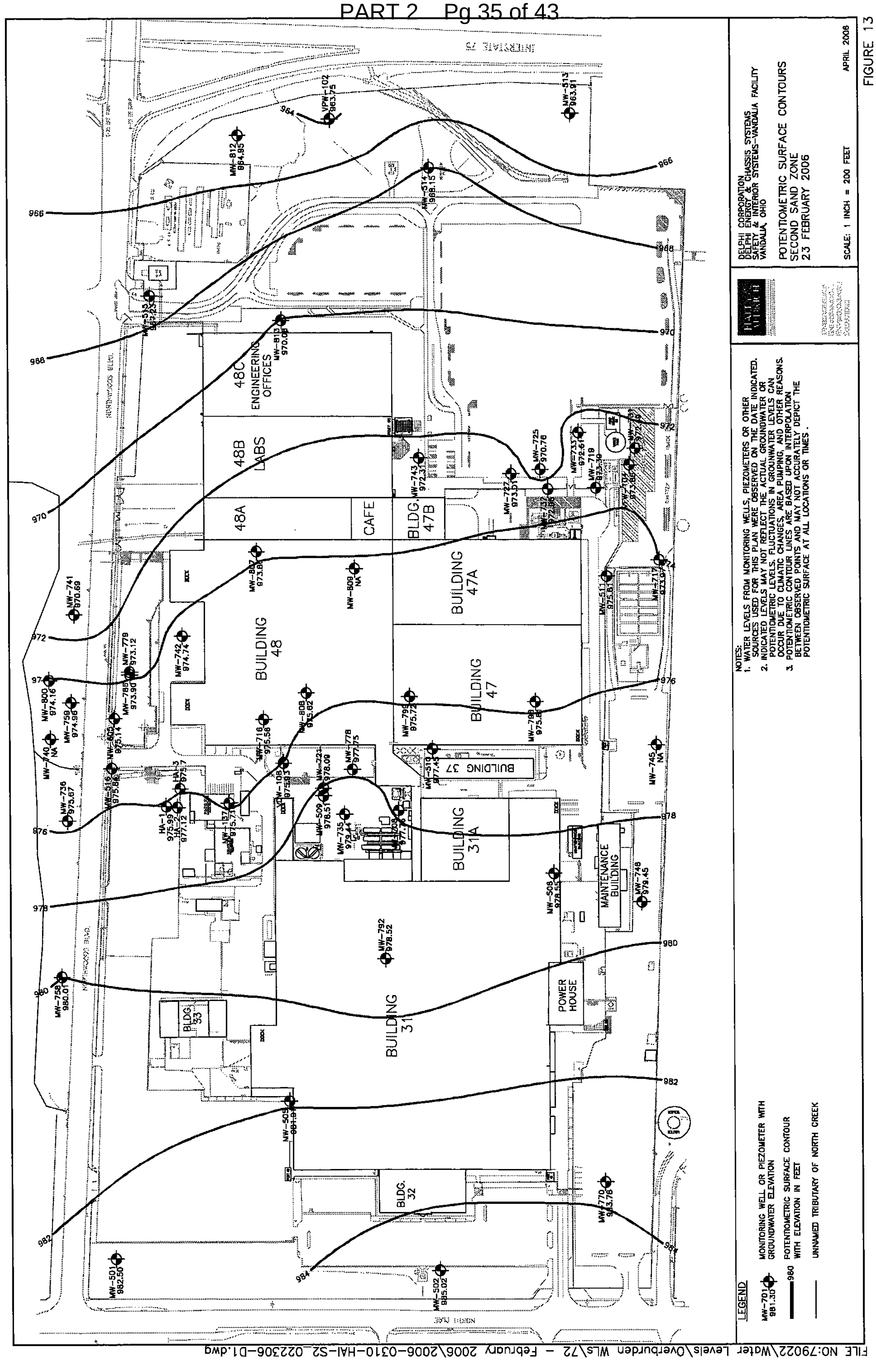
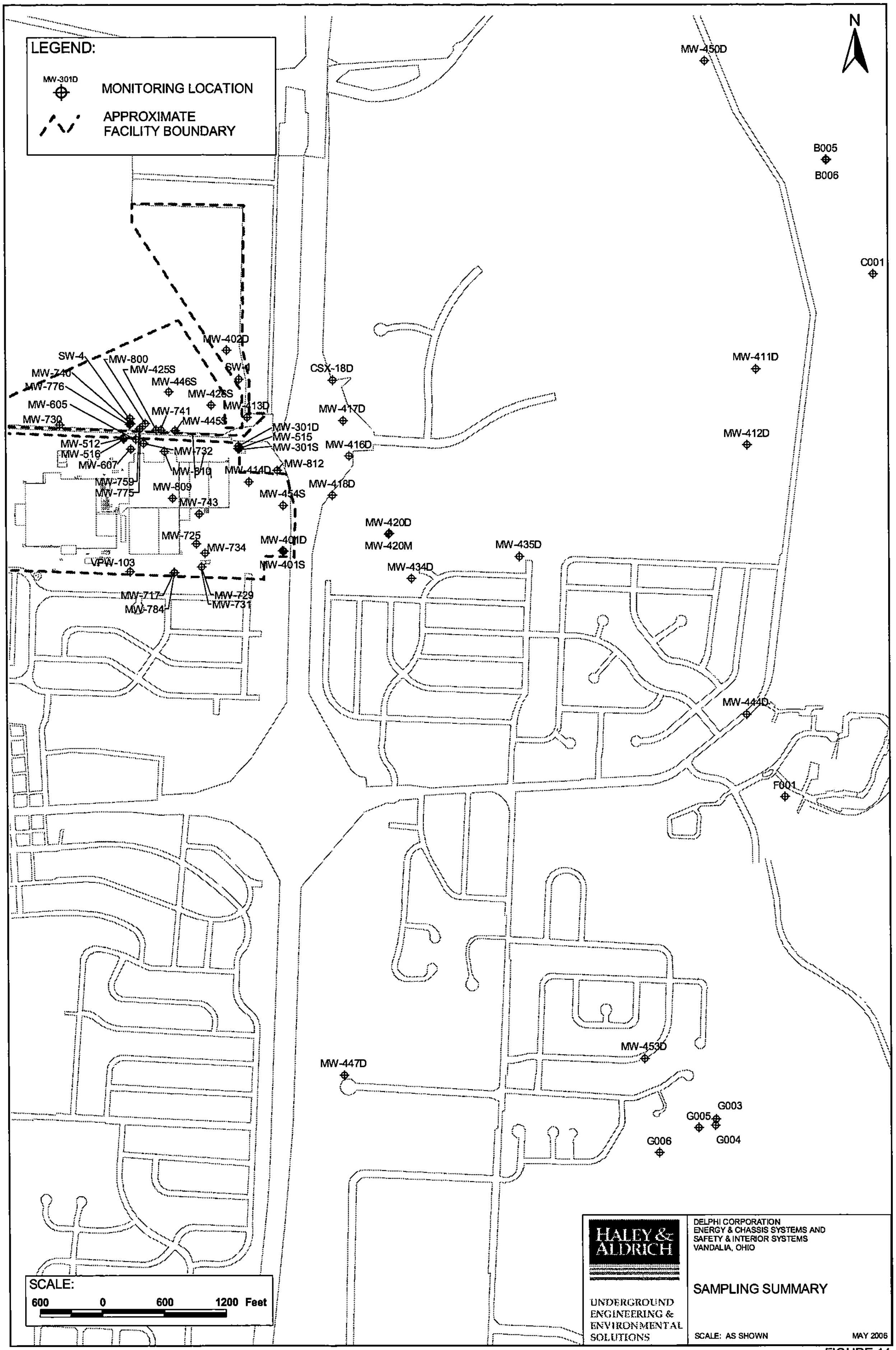
MONITORING WELL MW-759
TRICHLOROETHENE

MAY 2006

FIGURE 12



DELPHI CORPORATION
DELPHI ENERGY & CHASSIS SYSTEMS
DELPHI SAFETY & INTERIOR SYSTEMS-VANDALIA FACILITY
VANDALIA, OHIO
POTENTIOMETRIC SURFACE CONTOURS
SECOND SAND ZONE
23 FEBRUARY 2006
SCALE: 1 INCH = 200 FEET
APRIL 2006
FIGURE 13
NOTES:
1. WATER LEVELS FROM MONITORING WELLS, PIEZOMETERS OR OTHER SOURCES USED FOR THIS PLAN WERE OBSERVED ON THE DATE INDICATED.
2. INDICATED LEVELS MAY NOT REFLECT THE ACTUAL GROUNDWATER OR POTENTIOMETRIC LEVELS. FLUCTUATIONS IN GROUNDWATER LEVELS CAN OCCUR DUE TO CLIMATIC CHANGES, AREA PUMPING, AND OTHER REASONS.
3. POTENTIOMETRIC CONTOUR LINES ARE BASED UPON INTERPOLATION BETWEEN OBSERVED POINTS AND MAY NOT ACCURATELY DEPICT THE POTENTIOMETRIC SURFACE AT ALL LOCATIONS OR TIMES.
LEGEND
MW-701 981.30 MONITORING WELL OR PIEZOMETER WITH GROUNDWATER ELEVATION
980 POTENTIOMETRIC SURFACE CONTOUR WITH ELEVATION IN FEET
UNNAMED TRIBUTARY OF NORTH CREEK
INTERSTATE 75
48C ENGINEERING OFFICES
48B LABS
48A
CAFE
BLDG 47B
BUILDING 47A
BUILDING 48
BUILDING 47
BUILDING 37
BUILDING 31A
MAINTENANCE BUILDING
BUILDING 31
POWER HOUSE
BLDG 33
BLDG. 32
FILE NO:79022\Water Levels\Overburden WLs\72 - February 2006\2006-0310-HAI-S2_022306-D1.dwg
N


LEGEND:
MW-301D
MONITORING LOCATION
APPROXIMATE FACILITY BOUNDARY
N
MW-450D
B005
B006
C001
MW-411D
MW-412D
MW-402D
SW-4
MW-800
MW-740
MW-776
MW-425S
MW-446S
SW-1
CSX-18D
MW-426S
MW-413D
MW-417D
MW-605
MW-741
MW-445S
MW-730
MW-301D
MW-515
MW-301S
MW-416D
MW-512
MW-516
MW-732
MW-607
MW-810
MW-414D
MW-812
MW-418D
MW-759
MW-775
MW-809
MW-454S
MW-743
MW-420D
MW-420M
MW-435D
MW-725
MW-734
MW-401D
MW-401S
VPW-103
MW-434D
MW-717
MW-784
MW-729
MW-731
MW-444D
F001
MW-453D
MW-447D
G003
G005
G004
G006
SCALE:
600 0 600 1200 Feet
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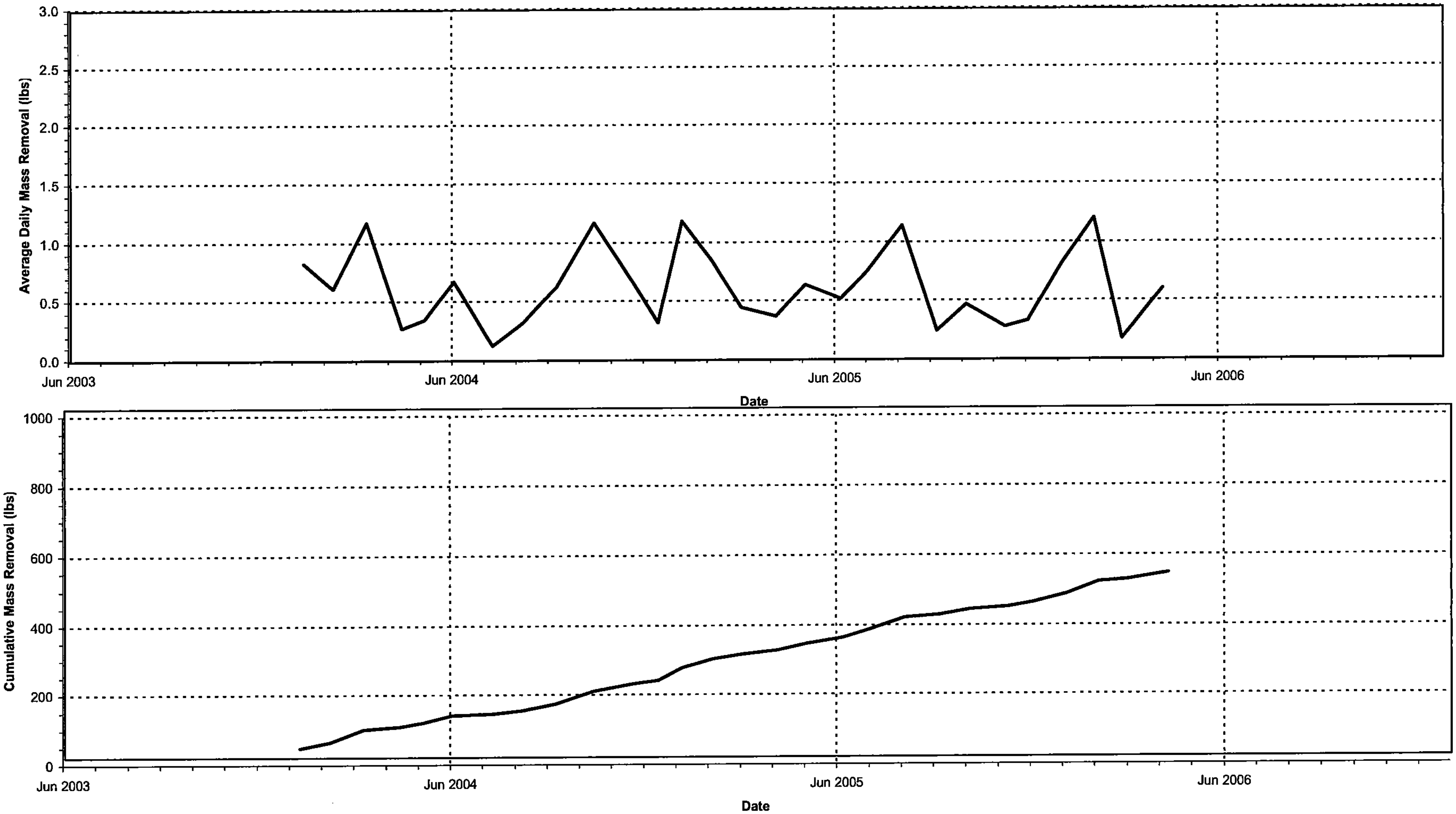
VANDALIA, OHIO
SAMPLING SUMMARY
SCALE: AS SHOWN
MAY 2006

FIGURE 14



NOTES:

1. MASS RECOVERY IS BASED ON MEASURED FLOW RATES AND VOC ANALYZER CONCENTRATIONS.
2. GRAPHS AND CUMULATIVE TOTAL REPRESENT THE PERIOD OF JANUARY 2001 TO APRIL 2006 (INCLUSIVE).

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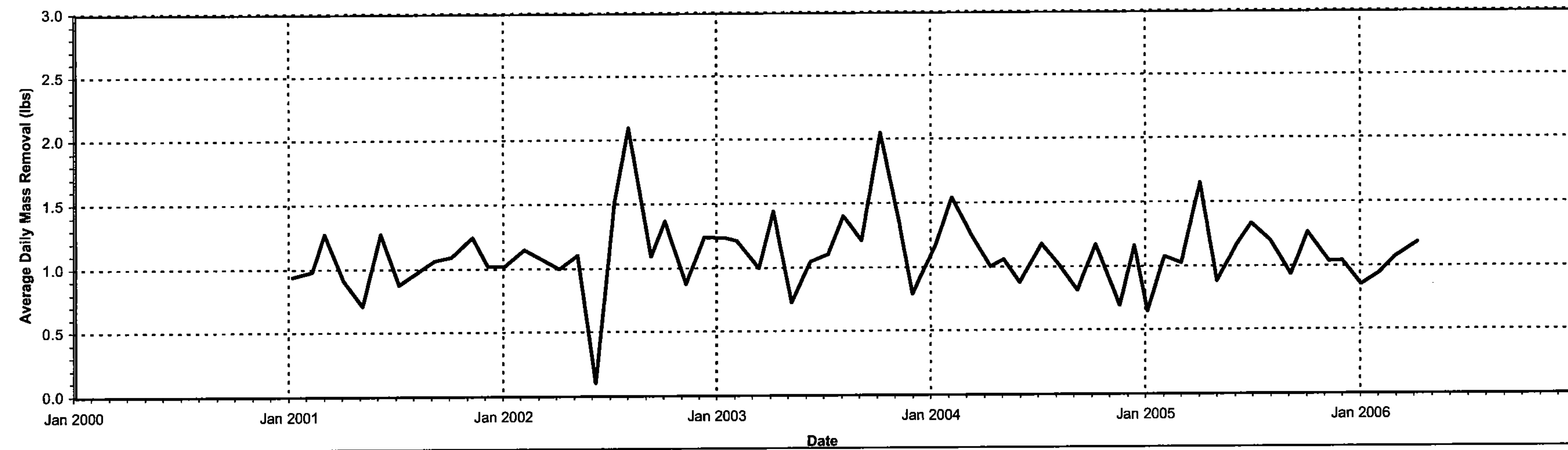
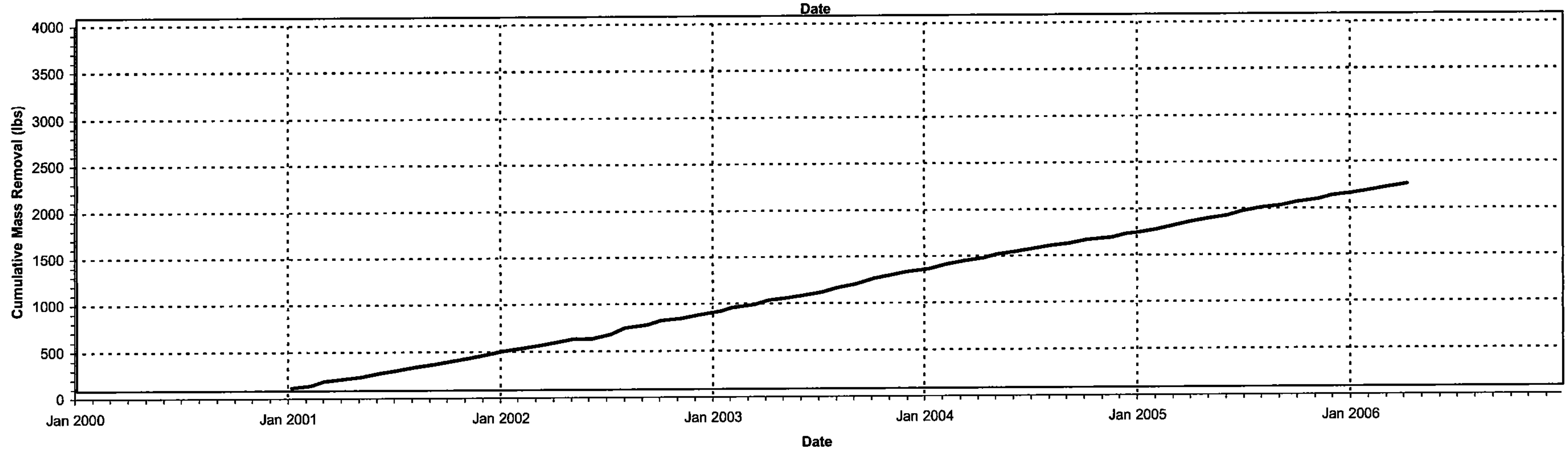
REMEDIATION SYSTEM PERFORMANCE SUMMARY - OVERBURDEN

SCALE AS SHOWN MAY 2006

FIGURE 15

FILE NO.: 79022-054





NOTES:

1. MASS RECOVERY IS BASED ON MEASURED FLOW RATES AND VOC ANALYZER CONCENTRATIONS.
2. GRAPHS AND CUMULATIVE TOTAL REPRESENT THE PERIOD OF JANUARY 2001 TO APRIL 2006 (INCLUSIVE).

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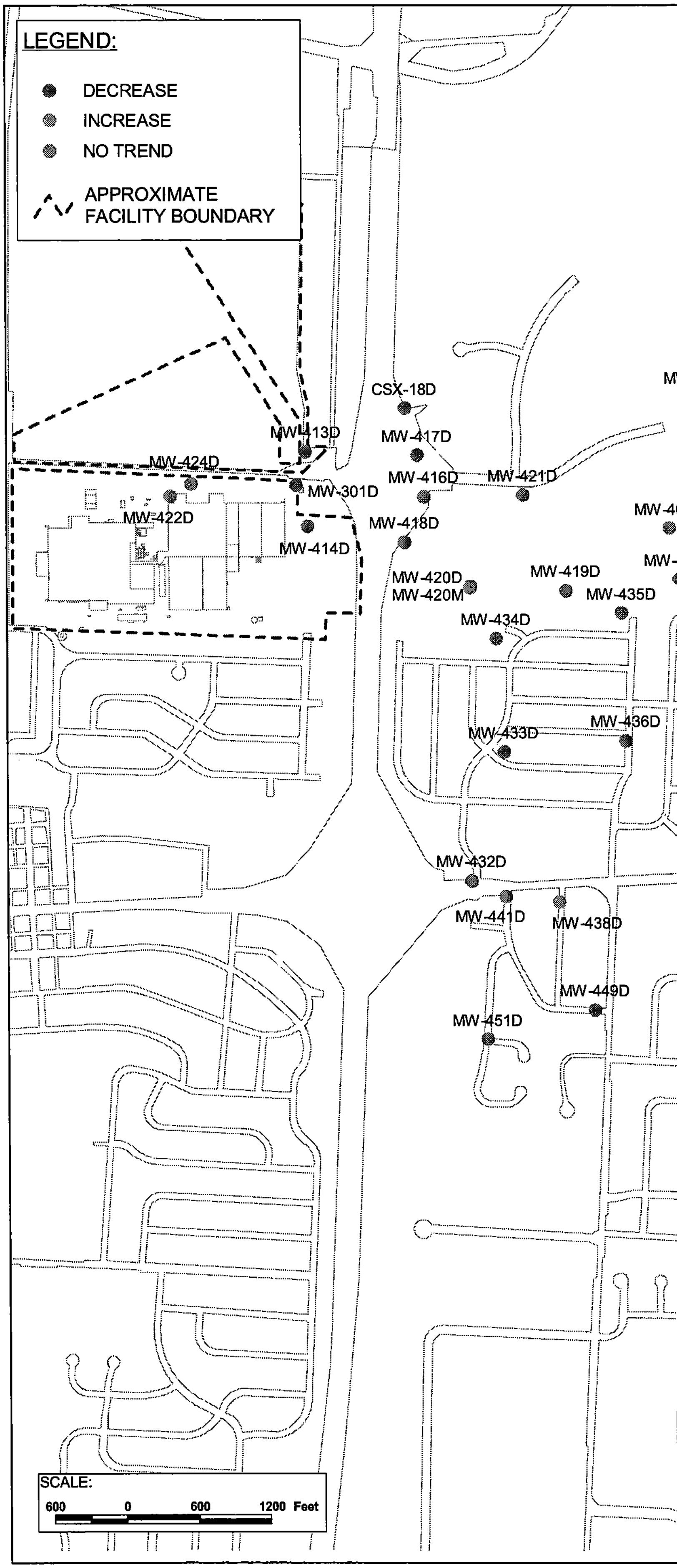
REMEDIATION SYSTEM PERFORMANCE SUMMARY - BEDROCK

SCALE AS SHOWN MAY 2006

FIGURE 16

FILE NO.: 79022-054



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VANDALIA, OHIO

RESULTS OF MANN-KENDALL TREND ANALYSIS OF SUGAR ROCK TRICHLOROETHENE

SCALE: AS SHOWN

MAY 2006

FIGURE 17

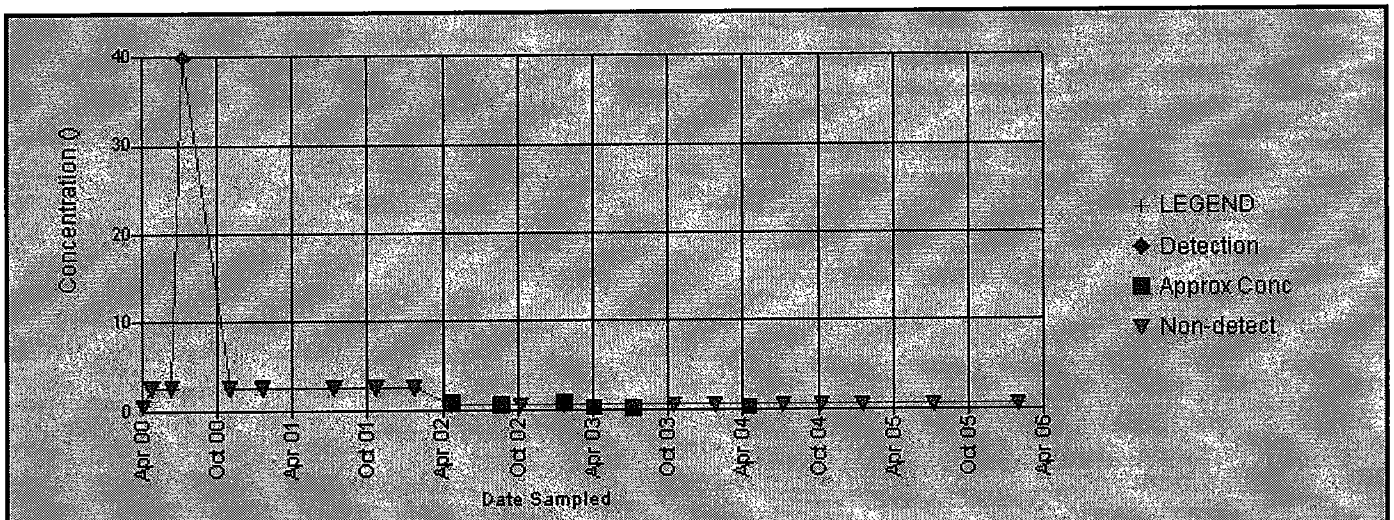
APPENDIX A

Sugar Rock Monitoring Well Mann-Kendall Trend Analysis

Delphi Corporation
Vandalia Facility
Vandalia, OH
Trend Since Deep Bedrock Groundwater Migration Control Start in April 2000 – Concentration in μg\L

Mann-Kendall Trend for Trichloroethene in CSX-18D

Statistic	Value
Sample Count	23
Average	2.81
Standard Deviation	8.14
Coefficient of Variation	2.89
Mann-Kendall Positives/Negatives	36/159
Mann-Kendall S statistic	-123
Z Test Statistic	-3.388
Significance Level	-99.9%
Trend (80% Significance Threshold)	**Decrease**

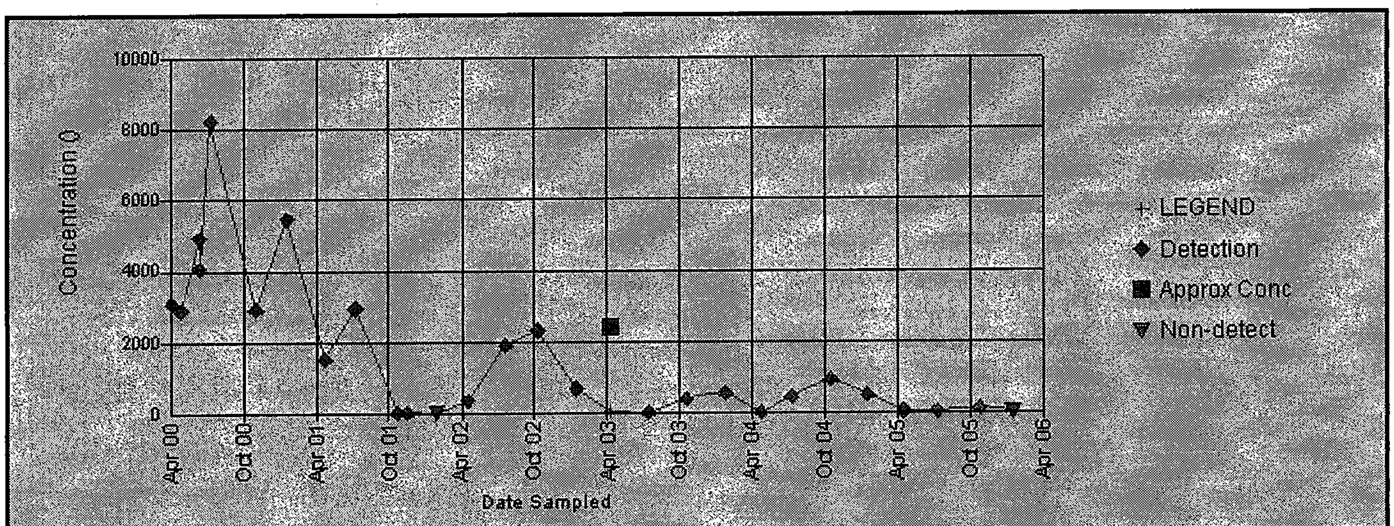


Note: The Mann-Kendall method is for sample counts greater than 40 as described in *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987). For sample counts less than or equal to 40, a lookup table of the Mann Kendall S statistic and the sample count should be used. However, Kendall (1975) indicates that the >40 method may be used for sample counts as low as 10 unless there are many identical values. A future version of Geode will include the lookup table for sample sizes <=40.

Delphi Corporation
Vandalia Facility
Vandalia, OH
Trend Since Deep Bedrock Groundwater Migration Control Start in April 2000 – Concentration in μg\L

Mann-Kendall Trend for Trichloroethene in MW-301D

Statistic	Value
Sample Count	28
Average	1,665.2
Standard Deviation	2,064.3
Coefficient of Variation	1.24
Mann-Kendall Positives/Negatives	99/279
Mann-Kendall S statistic	-180
Z Test Statistic	-3.536
Significance Level	-100.0%
Trend (80% Significance Threshold)	**Decrease**

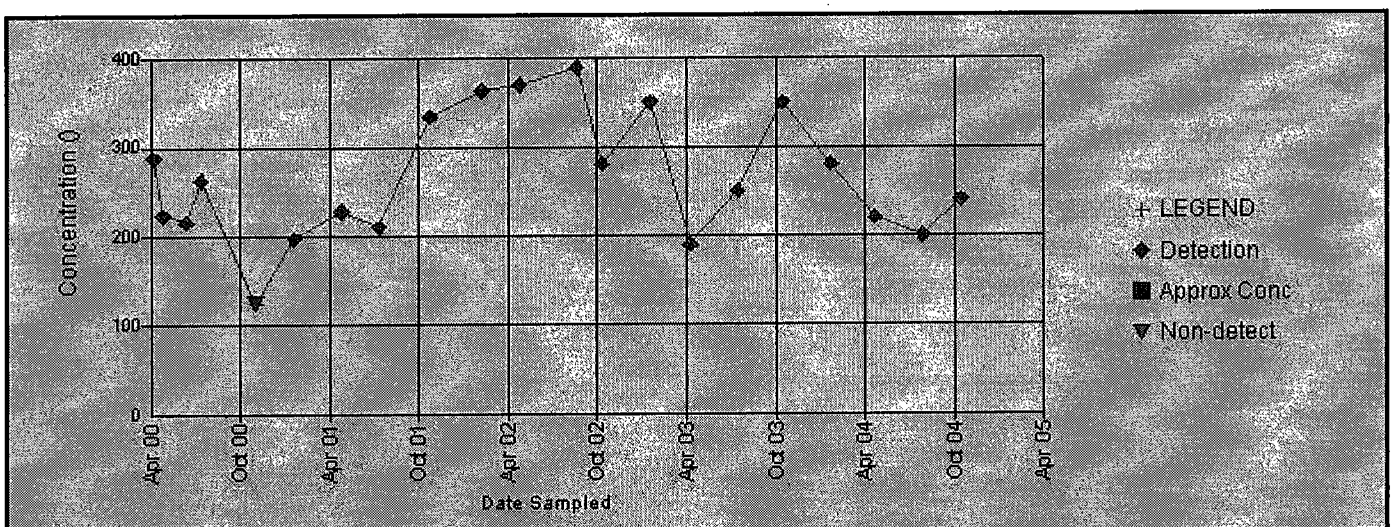


Note: The Mann-Kendall method is for sample counts greater than 40 as described in *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987). For sample counts less than or equal to 40, a lookup table of the Mann Kendall S statistic and the sample count should be used. However, Kendall (1975) indicates that the >40 method may be used for sample counts as low as 10 unless there are many identical values. A future version of Geode will include the lookup table for sample sizes <=40.

Delphi Corporation
Vandalia Facility
Vandalia, OH
Trend Since Deep Bedrock Groundwater Migration Control Start in April 2000 – Concentration in $\mu g \backslash L$

Mann-Kendall Trend for Trichloroethene in MW-407D

Statistic	Value
Sample Count	21
Average	265.1
Standard Deviation	71.5
Coefficient of Variation	0.270
Mann-Kendall Positives/Negatives	110/98
Mann-Kendall S statistic	12
Z Test Statistic	0.332
Significance Level	26.0%
Trend (80% Significance Threshold)	**No Trend**



Note: The Mann-Kendall method is for sample counts greater than 40 as described in *Statistical Methods for Environmental Pollution Monitoring* (Gilbert, 1987). For sample counts less than or equal to 40, a lookup table of the Mann Kendall S statistic and the sample count should be used. However, Kendall (1975) indicates that the >40 method may be used for sample counts as low as 10 unless there are many identical values. A future version of Geode will include the lookup table for sample sizes <=40.